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ABSTRACT

This monograph is based on papers presented at a technical review of patterns of cocaine use in the United States which was held in 1984. The foreword by Jerome H. Jaffe acknowledges that, over the past 10 years, cocaine has become a major public health threat in this country. Papers contained in this monograph include: (1) "Cocaine Use in America: Introduction and Overview" by Edgar H. Adams and Nicholas J. Kozel; (2) "Cocaine Use in the United States: In a Blizzard or Just Being Snowed?" by Richard R. Clayton; (3) "A Decade of Trends in Cocaine Use in the Household Population" by Herbert I. Abelson and Judith Droitcour Miller; (4) "Cocaine Use Among American Adolescents and Young Adults" by Patrick M. O'Malley, Lloyd D. Johnston, and Jerald G. Bachman; (5) "Cocaine Use in Young Adulthood: Patterns of Use and Psychosocial Correlates" by Denise B. Kandel, Debra Murphy, and Daniel Karus; (6) "Patterns and Consequences of Cocaine Use" by Dale D. Chitwood; (7) "Cocaine Abuse: Neurochemistry, Phenomenology, and Treatment" by Mark S. Gold, Arnold N. Washton, and Charles A. Dackis; (8) "Reinforcement and Rapid Delivery Systems: Understanding Adverse Consequences of Cocaine" by Sidney Cohen; (9) "Characteristics of Humans Volunteering for a Cocaine Research Project" by C.R. Schuster and M.W. Fischman; (10) "Characteristics of Cocaine Abusers Presenting for Treatment" by Sidney H. Schnoll, Judy Karrigan, Sarah B. Kitchen, Amid Daghestani, and Thomas Hansen; (11) "Cocaine Use in a Treatment Population: Patterns and Diagnostic Distinctions" by Frank H. Gawin and Herbert D. Kleber; (12) "Cocaine: Treatment Perspectives" by Donald R. Wesson and David E. Smith; (13) "New Patterns of Cocaine Use: Changing Doses and Routes" by Ronald K. Siegel; and (14) "Cocaine Use in America: Summary of Discussions and Recommendations" by Nicholas J. Kozel and Edgar H. Adams. The document concludes with a list of National Institute on Drug Abuse research monographs. (NB)

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Cocaine Use in America: Epidemiologic and Clinical Perspectives

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U. S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service • Alcohol, Drug Abuse, and Mental Health Administration

Cocaine Use in America: Epidemiologic and Clinical Perspectives

Editors:

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Division of Epidemiology and Statistical Analysis
National Institute on Drug Abuse

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Foreword

Over the past 10 years, cocaine, which has been characterized as powerfully addictive, has evolved from a relatively minor problem into a major public health threat.

In the early 1970s, evidence on the reinforcing potential of cocaine suggested that if the use of the drug became widespread major social and public health problems could ensue. Fortunately, NIDA had epidemiologic surveys and surveillance systems in place which enabled it to monitor the prevalence of drug use, cocaine-related emergency room cases, and treatment admissions. These efforts have documented dramatic increases in the use of cocaine in the general adult and high school populations of the United States. As the use of cocaine increased, parallel increases in emergency room visits, overdose deaths, and clinical problems reflected by increased treatment admissions were noted. Although the prevalence of cocaine use in the general population appears to have leveled off since 1979, the adverse consequences have continued to increase dramatically. Several explanations, including increased combination drug use, a shift to more dangerous routes of administration, and the lag time from first use to entry into treatment have been offered to explain this phenomenon. There is evidence to suggest that each of these explanations may in fact contribute to the increased negative consequences associated with cocaine. Yet, as much as we know about the epidemiology of cocaine use, many questions remain. It is unknown, for example, whether the increasing number of freebase users seen by clinicians reflects an increase in the numbers of people smoking freebase or a reflection of the increased risk of this route of administration. While our surveys have given us good estimates of the number of people who have used cocaine, we still need an estimate of the proportion of the using population who have experienced problems due to their drug use. In contrast, clinicians often see the problem users but may not collect sufficient drug histories so that risk may be assessed and have no contact with users who are not experiencing problems. The dialogue between epidemiologists and clinicians at the technical review on which this monograph is based increased the awareness of these issues and the benefits to be derived from increased interaction between epidemiologists and clinicians. One result of the technical review was the inclusion of a problem measurement section in the 1985 National Household Survey on Drug Use. Another is the publication of this monograph which represents an important contribution to our understanding of cocaine use and abuse.

Jerome H. Jaffe, M.D.
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Cocaine Use in America: Introduction and Overview

Edgar H. Adams and Nicholas J. Kozel

In the mid-1970s, as the reinforcing potential of cocaine was being demonstrated in the laboratory, the prevalence of cocaine abuse in the general household population of the United States was increasing dramatically. The fourfold increase from 5.4 million in 1974 to 21.6 million in 1982 in the number of people who reported having tried cocaine at least once has been well documented (Blanken et al. 1985; Adams and Durell 1984). Based on data from the National Household Survey on Drug Abuse (1974-1984), lifetime prevalence of cocaine use continued to increase into the early 1980s. The number of current users (used in the past 30 days), however, remained stable between 1979 and 1982.

Recent reports of increasing emergency room cases associated with cocaine, increasing deaths, and rising treatment admissions for cocaine problems have heightened concern that the incidence (new use) of cocaine use may be increasing once again.

On the other hand, it has been suggested that this increase in untoward effects of cocaine use is the result of changing routes of administration and more intensive patterns of use, including the use of cocaine in combination with other drugs. It has been noted also that the median time from first use of cocaine to entry into treatment for cocaine related problems is approximately 4 years. Thus, the increase in untoward effects may not reflect new incidence of cocaine use, but rather more destructive patterns of use in the prevalence pool, the size of which stablized 3 to 4 years ago.

Whether we are talking about increases in the size of the prevalence pool of abusers of cocaine or shifting patterns of use within a relatively stable prevalence pool has clear implications for the prevention programs designed to deal with this problem. In the former case, a program would be designed to prevent the initiation of cocaine use, while in the latter the approach would attempt to alter any progression or intensification of use.

That we are in a situation of providing plausible hypotheses to explain the apparent paradox of stable prevalence pools with increasing consequences reflects our lack of knowledge of drug use patterns in the general population. Specifically, data from clinic populations indicate a shift to more dangerous routes of administration, i.e., intravenous use and smoking freebase, more frequent administration, increased dosages, and use of cocaine in combination with other drugs. Yet, in the general population, little is known about these patterns or about the probability of progression from occasional to more intensified patterns of use. This monograph results from a technical review which attempted to explore these issues.

The subtitle of Clayton's paper "In a Blizzard or Just Being Snowed?" is reflective on this question which so pervades the popular press. Clayton poses a number of questions about the prevalence of cocaine use, characteristics of users, the length of time between first use and regular use, and the proportion of users suffering problems which can be attributed to their cocaine use. While these types of questions have been proposed for other drugs, the emphasis on cocaine is due to the perception that cocaine use has permeated all strata of our society. Using a variety of data sets, Clayton attempts to address these questions. He notes that while prevalence has increased sharply during the past decade, cocaine use is clearly not normative in our society. Perhaps more importantly, he demonstrates that not only are cocaine users likely to abuse multiple drugs, but that they are not naive users in the sense that most have used other drugs, especially marijuana, prior to the use of cocaine. Thus, the population at greatest risk of cocaine use is that population which has used marijuana, especially those individuals who have used marijuana 100 or more times.

From a temporal perspective, it is noted that the epidemic of cocaine use began in 1976 and continued through 1981. The extent to which the epidemic continues to increase remains open to question.

The National Survey on Drug Abuse began in 1971 under the auspices of the National Commission on Marihuana and Drug Abuse. This is significant in that, unlike the case with marijuana, the implementation of the National Survey predated the epidemic increases in cocaine use. Thus, Abelson is able to trace this increase in cocaine use in the household population from the mid-1970s through 1982. He notes that there were increases in use among all age groups from 1976 to 1979, but that use, at least among youth aged 12 to 17 and young adults aged 18 to 25 appears to have reached a plateau since 1979. Abelson goes on to suggest that cocaine use among those 18 to 25 is more likely to include residents in large metropolitan areas of the Northeast or Western part of the United States, as well as white college educated males. He points out, as did Clayton, that the cocaine user is a multidrug user who often uses more than one drug on the same occasion.

Analyzing data from a survey of graduating high school seniors and a panel of high school graduates beginning with the class of 1976, O'Malley demonstrates a doubling of annual prevalence between 1975 and 1979 with subsequent leveling since that time. Consistent with data cited by Abelson from the National Survey, cocaine prevalence predominates among males, and those individuals residing in the Northeast and West, and in urban areas.

Perhaps more importantly, followup data from various classes indicate increasing prevalence of use with each successive year following graduation. These increases are striking because other illicit drugs show little change or even decrease in use subsequent to graduation. This suggests that the age of risk for initiation into cocaine use continues beyond that for other drugs. This finding is consistent with that reported by Kandel in this monograph, i.e., the hazard rate or age-specific incidence rate for cocaine increases through the midtwenties. Adams et al. (1985) also have shown that increases in annual prevalence of cocaine use in the 26 and older group in the National Survey are the result of new use and not just aging of the population.

The issue of progression, that is, the extent to which cocaine use at one point leads to more frequent and/or intensive use patterns in the future is addressed in this monograph. Siegel, for example, describes the use patterns of 99 volunteers who have been followed since 1974. He describes five levels of cocaine use patterns: experimental use, social recreational use, circumstantial-situational use, intensified use. and compulsive use. The 99 volunteers were all social-recreational users when recruited in 1974. While some users remained social-recreational users the overall pattern of use from 1978 through 1982 marked an escalation in dosages and dose regimes in this population. Using another approach, both O'Malley and Chitwood have constructed indices of cocaine use and have attempted to look at transitions between levels of use. Using an index based on frequency of use, O'Malley analyzes use patterns beginning in the base year, that is graduation year up to 3 to 4 years postgraduation. The base year measurement shows that only 1.2% of the responding population had used cocaine 10 or more times during the previous year, while the second followup in a population now aged 21 to 22 shows that 4.7% had used cocaine 10 or more times in the previous year. It is interesting to note the transitions that take place between and among the various frequency of use categories in this population. Using retrospective data in a population of cocaine users, Chitwood developed an index based on self-reported route of ingestion, frequency of use, and quantity of use. Overall, there was a progression in level of cocaine use from the initial year of use. For example, in the initial year only 7% of the population were considered high level users, whereas 27% of the population were high level users during the most recent time frame. As with the case of the data obtained from graduating high school seniors, there was migration between various use levels. Thus, while in general there appears to be some progression in the use of cocaine, progression is not inevitable.

Using data derived from a population who have been followed since they were in the 10th and 11th grades in 1971 and 1972, Kandel assesses patterns of cocaine use and developmental patterns of involvement in drug use in this population now in their mid-twenties. Kandel compares five groups ranging from "no illicit drug use" to "used cocaine plus other illicit drugs." The two cocaine groups included "use of cocaine with marijuana" as the only other illicit drug "used" and "use of cocaine plus other illicit drugs." Interestingly, more that 80% of the cocaine users fell into the latter category.

The groups were examined in six areas of lifestyle and level of functioning. Those who had used cocaine plus other illicit drugs were the most deviant of all groups, including those who had used other illicit drugs except cocaine. This finding tends to be consistent with the findings by Kaufman (1982), who has noted greater psychopathology in multidrug users.

Drawing on yet another population, in this case, a purposive sample of cocaine users in treatment plus a snowball sample of users not in treatment, Chitwood examines two key questions: (1) problems associated with measuring patterns of cocaine use, and (2) consequences of cocaine use.

Problems measuring patterns of cocaine use can be viewed from a variety of perspectives, including the way in which the data are collected (e.g., self-report or toxicologic analysis) as well as the operational definitions and measures employed in the analysis. For example, use and nonuse measures can be used to answer questions about exposure, but cannot be used to relate consequences to intensity of use or, more specifically, dose effect relationships. As with the measurement of drug patterns, consequence data can also be collected either as self-report or through clinical examination. Consequences can be either the result of acute effects of the drug or debilitating effects resulting from chronic administration. Chitwood examines these issues and relates the consequences not only to level of drug use but also to route of administration.

Individuals calling into "Hotlines" constitute another useful population from which patterns and consequences of cocaine use can be described. These data are the subject of discussion by Gold and his colleagues. The large number of phone calls, now in excess of 450,000, provide an invaluable source of data on a self-selected sample of users motivated to call a hotline and report their problems and concerns.

Gold and his colleagues discuss drug use patterns and self-reported consequences on three separate populations, based on a national survey of a subset of callers, upper income users, and adolescent users. In addition, Gold and his colleagues discuss the neurochemistry of cocaine and treatment issues, including pharmacological adjuncts to treatment.

In making the transition from the general population and subsets of the general population to clinical populations, Cohen reviews the reinforcing properties of cocaine and consequences based on these reinforcing properties, as well as other factors including toxicity, route of administration, and interaction with other diseases and drugs. The reinforcing properties of cocaine, coupled with effective delivery systems and a relatively short biological half-life, lead many to a pattern of compulsive use which ultimately can cause disruptions in families and job performance as well as physical and mental deterioration. These patterns may lead to the use of more dangerous routes of administration and/or higher dosages in which the risk of untoward effects due to, for example, the cardiovascular actions of cocaine, is increased.

Characteristics of intravenous cocaine users volunteering for a cocaine research project are reported by Schuster and Fischman. The extent of polydrug use in this population is striking. More than half (57%) of the volunteers accepted into the experiment had used drugs from four or more classes of drugs in addition to cocaine. Only 10% used cocaine alone. An important aspect of the data provided in this chapter is that they were gathered from individuals volunteering for research projects and not seeking treatment. It is suggested that screening data of this type may provide an important source for information about drug use in non-treatment populations.

Schnoll et al. and Gawin and Kleber report on populations seeking treatment for cocaine abuse. The population reported on by Gawin and Kleber was 80% white, while Schnoll et al. reported an approximately equal distribution (45.3% black). The routes of administration generally considered to be more reinforcing, i.e., intravenous use and freebasing, were reported by more than 60% of these populations. In each of these populations, freebase cocaine smokers used more cocaine than either intranasal or intravenous users.

Schnoll et al. suggest that since cocaine users in his treatment population had long histories of use of other drugs, but did not seek treatment, they may have been able to control their drug use prior to using cocaine.

Gawin and Kleber looked at psychiatric diagnosis by route of administration and abuse patterns and suggest that the dangers of intranasal use have been underestimated since the highest proportion of subjects with diagnoses were cocaine snorters (intranasal users). The subjects had low weekly cocaine use but high intensity of use over short duration. This suggests not only the potential danger of intranasal use, but also that more attention must be given to collecting data on the patterns of use, including whether binges occur, how often they occur, how long they last, etc.

An overview of treatment perspectives, including signs and symptoms of cocaine dependence as well as recommendations for the management of cocaine dependence, is provided by Wesson and Smith. They also note that a large proportion of this population is involved in the stimultaneous use of sedative hypnotics in combination with cocaine. The effect is that the population entering treatment is often dually dependent on cocaine and a sedative hypnotic, often alcohol. This can, of course, increase the severity of withdrawal as well as increasing the complexity of the treatment. Problems in treating associated psychiatric disorders in addition to the treatment of dependency also are discussed.

The history of cocaine use from a perspective of changing attitudes, routes of administration, and dosages is reviewed by Siegel. He also reports that some users are employing new routes of administration, i.e., among select populations intranasal use of freebase and the smoking of coca paste. He reports that contrary to user beliefs, the use of intranasal freebase does have risks of dependency and toxicity.

The use of coca paste, the dangers of which are well documented, appears to be restricted to individuals associated with clandestine laboratories and trafficking. This is consistent with findings of Kozel (1985) in recent studies in Miami and New York.

Overall, there is an increasing recognition that, although clinical populations are subsets of the general population, clinical impressions may not reflect what is happening in the population as a whole. Similarly, population surveys may not adequately measure problem subgroups. For example, while only 4% of high school students reported injecting cocaine, more than 20% of those admitted to treatment did. Recognizing that different populations are being measured is critical when interpretations of the data are made.

All clinical populations, as well as those "hotline" participants with self-identified problems, reported high rates of smoking freebase or intravenous use; although it must be noted that intranasal use was reported by a large number of users. This is important since the dangers of intranasal use are often overlooked due to the increased attention paid to the "more dangerous" routes of administration.

Another factor which was consistent across all data sets was that cocaine users are not naive users. On the contrary, many of them have been heavily involved with other drugs and virtually all have used marijuana.

Attempts by O'Malley, Chitwood, and Siegel to address issues of progression and to measure levels of use represent interesting approaches to understanding this problem. Similarly, in clinic populations, further efforts to define use patterns through grams used, length of run, etc. will prove invaluable in identifying risk factors and relating use patterns to consequences.

Finally, the need for improved problem measurement in the general population and in clinic populations, including the use of diagnostic measures in general population surveys, is an area in which rapid progress can be made. In this regard, some of the measurement concepts contained in this monograph represent a foundation on which future efforts will be built.

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Cocaine Use in the United States: In a Blizzard or Just Being Snowed?

Richard R. Clayton

INTRODUCTION

There has been a great deal of discussion recently about the extent to which this country has been inundated by cocaine. Stories abound about the incredible profits being made by the cocaine barons. Sordid tales exist about the violence being perpetrated by the cocaine cowboys in south Florida. The sports pages are filled with stories about newly rich athletic heroes whose lives are being ruined by cocaine. Richard Pryor makes fun about playing with fire as if his experience with freebasing is a joke. Bob Woodward's biography about the fast life and times of John Belushi and his untimely death from a speedball mixture of heroin and cocaine creates quite a stir in the media. John DeLorean has "name recognition" as much because of his sensational trial for allegedly trying to set up a cocaine deal to refinance his failing company as for his superbly engineered and innovative automobile. It's "big news" when some glamour figure gets busted for the possession or distribution of cocaine or when they check into some well-known treatment center for a cocaine problem.

It is quite possible that Orwell may have been incorrect in describing "big brother" as the Government spying on its citizens. A more likely culprit is the American public, peeking through the television set like a collective voyeur at the private lives of public people. There is a real danger in this.

One can be easily lulled into thinking and believing that this picture reflects reality; that the "beautiful and rich" people, the chic, the jet-setters, and the sports stars are all caught up in the use of cocaine. This illogical leap in reasoning leads to the inference that if one wants to be like his or her hero, then one must do as they do, and what they do is okay because it is related to "success." Simply put, cocaine use has been publicized and glamourized to the point where some define it as a symbol of success, an experience for those who have "arrived."

The subtitle to this paper, "In a blizzard or just being snowed?", is a rhetorical question containing two words/terms that involve snow, a word that has many different meanings. One of these terms

is "being snowed." This term usually refers to a situation in which individuals are so impressed by another person that they are unable to see that person for who and what he or she really is. They are snowed blind to the other person's faults and cannot be objective in their appraisal of them. The other term is "blizzard," which refers to a massive snow storm that impairs visibility and quickly covers the landscape.

The purpose of this paper is to examine some of the following questions that illustrate the rhetorical question contained in the subtitle of the paper.

> Is cocaine use strongly correlated with "success" as traditionally measured in our society? Stated differently, are the stories that appear in the media about cocaine use among stockbrokers, lawyers, and other professionals more stereotypical than typical?
>
> Are we "being snowed" into thinking that cocaine use is widespread in the centers of finance, learning, justice, and power in the United States?
>
> On the other hand, is it possible that use of cocaine in the United States is not so chic after all?
>
> Is cocaine like most other drugs in our society, that is, most likely to be used among those traditionally most at risk for becoming involved with illicit drugs, the lower class?
>
> Is cocaine use more prevalent among those at the lower end of the educational, occupational, and social ladders; those already involved with other illicit drugs; and/or those not particularly flush with money to buy such commodities?
>
> Who in the "general" population uses cocaine?
>
> What characteristics distinguish cocaine users from non-users?

Some of these questions can be addressed with data from existing epidemiological surveys. However, it would be virtually impossible to determine if cocaine use is disproportionately higher in some very restricted occupational groups (e.g., professional athletes, entertainers, those who are independently wealthy) because the percentage of the population in these categories is so small. Unfortunately, these persons receive such an inordinate amount of attention from the media that anything they do is reported in great detail. Further, there is a tendency in the mass media to focus on the wealth and conspicuous consumption involved ("He went through a million dollars of cocaine in a year!"). This type of sensationalism merely panders to the fantasy lives of Americans and, in fact, paints what may be a totally distorted picture of reality.

Are we being "snowed" about who is using cocaine and the connection of its use with indicators of success? Is it also possible that there is a "blizzard" of cocaine use occurring in the United States that deserves special attention by public health authorities? Stated differently, has our society undergone an epidemic of cocaine use that has permeated strata of society previously untouched by the problem of illicit drug use? The best answer at this point in time is: Perhaps. However, before we attempt to provide answers to these types of questions, it is important to review the reasons for giving special attention to cocaine.

REASONS FOR GIVING SPECIAL ATTENTION TO COCAINE

There may be literally hundreds of reasons for singling out the use and abuse of cocaine as an issue of special concern. However, there are three reasons in particular that justify the sense of urgency and concern that has recently emerged about this drug. These are: (1) the persistence and perpetuation of myths about cocaine and its effects on users; (2) the "magnitude" of the problem of use and abuse of cocaine in the United States; and (3) the potential social and economic costs that may be associated with this drug, given the incidence and prevalence rates and the presumed sociodemographic characteristics of users and abusers.

Myths About Cocaine

Ours is a society in which there is a great deal of pride about the sophistication of communications systems and the openness of the media to competing views. However, these systems seem often to become insulated from evidence that does not support the prevailing myths about various commodities. This has certainly been the case with marijuana. It seems to have taken a long time for scientific evidence concerning the harmful effects of marijuana use to penetrate the popular media and, thus, begin to counter the prevailing myth that use of marijuana is relatively benign vis-a-vis other drugs such as alcohol and tobacco.

Existing data do not provide support for the following assertions or "myths": (1) cocaine is not addicting; (2) cocaine will improve your sex life; (3) practically everybody is using it; and (4) use of cocaine is a symbol of success, of having "arrived" socially.

There is substantial evidence about how powerfully reinforcing cocaine is (Wise 1984; Jones 1984) and its dependence liability (Johanson 1984). There is also evidence that persons who abuse cocaine develop tolerance, undergo withdrawal symptoms, and meet other criteria commonly used to describe addiction (Morningstar and Chitwood 1983). Articles in the popular press often tout the potential of cocaine for enhancing sexual performance. However, Chitwood (this volume) presents data to show that the greater the involvement with cocaine, the lower the interest in sex. In fact, impotence is not an unusual consequence of the abuse of cocaine. As to the claim that practically everybody is using cocaine, one

need only examine the epidemiological data to know that this is not true. For example, among national samples of high school seniors, 9% in the class of 1975 had used it. There was a steady increase in the percent having ever used cocaine up to 1981, when the rate was 16.5%. In the classes of 1982 and 1983 some 16% reported use of cocaine. Among seniors in the class of 1983, some 11.4% report having used cocaine in the previous year and 4.9% in the previous 30 days. The last time the annual and 30-day prevalence rates were this low was in the class of 1978 (Johnston et al. 1984). Data from the 1982 National Survey on Drug Abuse (table 1) indicate lifetime, annual, and past month prevalence rates by sex and age group.

TABLE 1

COCAINE PREVALENCE RATES BASED ON THE 1982 NATIONAL SURVEY ON DRUG ABUSE

	Percent Who Used Cocaine		
	Ever	Past Year	Past 30 Days
Males			
Youth, 12-17 years old	7	5	2
Young Adults, 18-25 years old	35	25	9
Mid-Adults, 26-34 years old	26	13	4
Older Adults, 35 or older	7	3	1
Females			
Youth, 12-17 years old	6	3	2
Young Adults, 18-25 years old	22	13	5
Mid-Adults, 26-34 years old	18	9	3
Older Adults, 35 or older	2	1	0

It is clear from these data that use of cocaine is not normative, at least not statistically, in any of these age and sex groups. However, it is equally clear from a public health perspective that the rates of use of cocaine are far too high, particularly among young and mid-adults.

With these facts-versus-myths in mind, it is important for us as drug abuse specialists to weigh carefully what is said about cocaine. We have a special responsibility to "demythologize" cocaine for the American public. In addition, as public health specialists, we must begin to anticipate and develop plans for dealing with emerging health problems. It is quite possible that use and abuse of cocaine is emerging as a problem.

Magnitude of the Problem

There seems to be general agreement that an "epidemic" of cocaine use has occurred or is occurring in the United States, and perhaps in other countries as well (Adams and Durell 1984). Because it is emergent, we do not yet know the scope of the problem, whether it has peaked or is still on the upswing, or when it might level out and begin to decline. It will be important for epidemiologists to compare the cocaine epidemic of the 1980s with the cocaine epidemic that occurred in the 1880s. Will this new epidemic die out rather quickly as did the epidemic of the last century, or will it follow a different course and produce a sizable population of chronic cocaine users (Mandell 1984)?

We know from laboratory studies that animals given unlimited access to cocaine will keep using it until they pass out from exhaustion or convulsions or until they die from overdose (Deneau et al. 1969; Johanson et al. 1976). Even if one is extremely cautious in extrapolating from these data to humans, it is clear that the reinforcement properties of cocaine make it imperative that we understand better the parameters of the cocaine epidemic of the 1980s. The following exercise in logical inference is based on data from the 1982 National Survey on Drug Abuse and illustrates rather dramatically the potential magnitude and scope of the cocaine problem in the United States, justifying a sense of urgency about it.

* Of all persons in the household population in the United States who were 12 years old or older, 22 million persons had used cocaine at some time during their life.

* The "biggest" step in the process of drug use is from nonuser to user. Given the reinforcing properties of cocaine, it is likely that very few people ever use cocaine only once and never try it again. Therefore, at least 22 million Americans were vulnerable to a continuation of use or a progression to more intensive use of cocaine. This is clearly an underestimate because the National Survey is based on a sample of the "household" population and excludes persons who are transients and those who live in institutional settings such as college dormitories, on military bases, and in jails and prisons.

* Of the 22 million who have used cocaine, let's assume that only 10% have used it more than occasionally. This would mean that there are 2.2 million Americans who are even more vulnerable or "at risk" for continuation of use or progression to abuse of cocaine. This is not an unreasonable estimate.

* Let's assume that one-half of those who have ever used cocaine more than occasionally are seriously at risk for continuation of use or even progression to abuse of cocaine. We are now talking about 1.1 million persons in the overall household population, 5% of those who have ever tried cocaine.

* To make our estimates of the magnitude of the potential cocaine problem even more conservative, let's assume that only one-half of the 1.1 million seriously at risk for continuation of use or progression to abuse are at risk for having "significant" problems from their involvement with cocaine. This would equal 550,000 persons in the general household population--only 2.5% of the 22 million Americans who have ever tried cocaine.

The estimate of 550,000 Americans who may be significantly at risk for experiencing problems from their use and abuse of cocaine is a conservative one, an "underestimate" of the "true" prevalence of the number of problem users of cocaine in this society.

From an historical perspective, the estimate of 550,000 is significant. When it was estimated in the early to mid-1970s that the number of heroin addicts in the United States was about 500,000, the Federal response was swift. In terms of order of magnitude, the estimates generated above for problem cocaine users justify a sense of urgency at the Federal level to focus more attention on the "cocaine problem" in the United States.

There are a number of important research questions that emerge quite naturally from the inferential process outlined above.

* What are the patterns of use of cocaine in this society and how do these patterns vary across relevant groups (male versus female, youth compared to the three adult groups, whites compared to members of racial minority groups, etc.)?

* How long does it usually take to move from first use of cocaine to the onset of "regular" or "habitual" use?

* What proportion of "regular" users seem to be able to moderate their use without progressing to abuse of cocaine? What distinguishes those who are able to moderate their use from those who progress to abusive patterns?

* At what point in a cocaine-using career do problems or consequences directly attributable to cocaine usually begin to appear?

* What proportion of users or abusers of cocaine are exhibiting problems or consequences from their use of the substance? What kinds or types of users are exhibiting the various consequences? What are the treatment and other needs of users and abusers of cocaine?

* If prevention and intervention efforts are developed, who should be targeted (i.e., youth versus adults), with what emphasis, using what techniques, and in what kinds of settings?

These questions take on added significance when it is reported that the price of cocaine on the streets has been going down dramatically while the purity has been going up. Further, clinicians who specialize in the treatment of drug-abusing patients report that the number of persons seeking help for cocaine abuse seems to be increasing (Kleber and Gawin, this volume; Schnoll, this volume).

Social and Economic Costs

The preceding section revealed in a rather simple fashion the possible extent of cocaine use in the United States. If these estimates are close to being "within the proverbial ball park," there are two very practical political and economic issues that need to be addressed. The first concerns macroeconomic estimates of a cocaine industry generally thought to be worth $50 to $70 billion annually. Even if these estimates of the size of the cocaine trade are inflated, the amount of money moving in the gray economy because of cocaine must exert a significant impact on the entire economic structure of our society. Regardless of their accuracy, such estimates point to the need for knowing the number of users and the levels of consumption that generate such large sums of money. This requires better epidemiological data and a fusion of these data with police and other types of intelligence data concerning drug trafficking. The second practical political and economic issue concerns the costs of drug abuse to American society in terms of treatment dollars, hospitalizations, and lost productivity and foregone earnings because of illness, disability, death, crime, and other consequences of cocaine use. From a cold, hard, and rational economic perspective, the productivity and foregone earnings lost to society because of the premature death of a street level heroin addict may be relatively small. This will be true especially if the addict has been chronically unemployed, in and out of treatment and jail, often involved in crime to support his or her habit, and receiving various kinds of transfer payments from the welfare system.

Let's assume, at least for a moment, that the reports of extensive cocaine use within professional and managerial categories of employment are not too exaggerated. Suppose a stockbroker, a Madison Avenue advertising executive, or a lawyer in a top firm dies prematurely from an overdose of cocaine. In this case, from

a cold, hard, and rational economic perspective, the foregone earnings loss to society of such a death could be substantial.

It is therefore imperative that the stories of personal tragedy that alert clinicians and health care personnel to the problems of cocaine abuse be linked with treatment data from other sources, with epidemiological data on the patterns of use, and with drug intelligence data, so that we can begin to understand better the social and economic costs to society of cocaine abuse.

It is clear at this point in time that there is a dearth of reliable data from all sectors of the drug abuse community from which the parameters and essential components of the cocaine problem can be validly assessed. It is equally clear from what little we know for certain, and from what we think we know, that cocaine is emerging as a public health problem requiring considerably more attention and anticipatory planning than it has received thus far.

We must also begin to weave together into a more coherent picture the somewhat conflicting images of the problem of cocaine use and abuse coming from different segments of the community of specialists who study and treat drug abuse. When one examines the incidence and prevalence curves from epidemiological surveys of the general population, there seems to be a leveling out of use. At the least, a plateau of use seems to have been reached (Abelson, this volume). However, as noted earlier, clinicians seem to be reporting a substantial increase in the number of middle class clients seeking therapy because of their dependence on cocaine (Kleber and Gawin, this volume; Schnoll, this volume). Some experts (Washton and Gold, this volume) claim the cocaine problem is concentrated in the more affluent segments of the class structure. However, even a cursory examination of data from clients in traditional drug treatment settings reveals a large proportion using cocaine (Craddock et al. 1982). Wish (1985) reports that over 40% of arrestees in central Harlem have the metabolites of cocaine in their urine. These are people at the bottom of the social class ladder, people who have very few skills to trade in the marketplace and who often exist on a subsistence budget. How can they afford to use the so-called "rich man's drug?"

How can these seemingly disparate findings be reconciled? Are we in the midst of an epidemic of cocaine use in the United States? Does the epidemic resemble a full blown blizzard, a snow storm, or just some snow flurries? Are we being snowed into believing a blizzard exists when, in fact, cocaine is just the latest fad drug to appear on the drug scene and is creating just a "temporary" fuss? Is the use of cocaine strongly associated with high social status or are we being snowed into believing this is so by narrow and biased reporting?

In the section that follows, we begin to address some of these questions with existing data from a variety of sources. The first data to be examined come from the treatment system and hospital emergency rooms (ERs).

PROBLEMS WITH COCAINE: EMERGENCY ROOM AND TREATMENT DATA

It would be fair to say that most seasoned observers of the drug scene see evidence of a cocaine epidemic occurring in the early to mid-1980s. Everyone is just waiting to see which direction it will take and what its eventual proportions will be. This can be seen most clearly in a report from the 15th Community Epidemiology Work Group covering the 6-month period from June through December 1983. In it, the following overall appraisal appears.

> Cocaine continues its high visibility in the drug scene. Of note is its emergence and increasing use among all socio-economic levels of the population. Reports from most cities indicate that cocaine is readily available with increasing purity levels and decreasing prices.

In a section of the same report dealing specifically with cocaine on a city-by-city basis, the following assessments appear.

> Once considered an upper class drug, cocaine use has crossed social class lines and is now becoming popular among all segments of society.
>
> San Francisco. Despite the apparent leveling off of use during 1983, there has been widespread and increasing prevalence of the more intensive usages of cocaine, particularly freebasing, injection, and a tendency to use the drug in a polydrug context.
>
> Los Angeles. The upsurge in cocaine indicators is dramatic--emergency room mentions continued to rise, police seizures almost doubled, and cocaine related overdose deaths increased by almost 50% between 1981 and 1983.
>
> Chicago. Cocaine is the only drug which shows a definite pattern of increasing use with indications of a significant increase in purity.
>
> St. Louis. Use of cocaine is increasing primarily among intravenous addicts. Police cases show steady increases, from 90 in 1981 to 120 in 1982, while treatment admissions for primary cocaine use rose dramatically from 35 during all of 1982 to 35 during the first 6 months of 1983.
>
> Denver. The police department reports that the major drug abused on the streets of that city is cocaine.
>
> Miami. Cocaine is the leading drug of those entering drug free treatment. There has been no change in the upward movement for cocaine use in Miami--ER mentions were up 23% and among those entering treatment, 50% reported cocaine as their primary drug of abuse.

In both Newark and New York, cocaine use has increased, particularly when reported as the primary drug of abuse at admission.

Washington, D.C. There is a significant increase of 33% in emergency room mentions for cocaine and a 20% increase in treatment admissions.

The figures reported above are rather high and alarming and seem to reflect a similar phenomenon in different regions of the country. At face value, they indicate agreement among trained observers about sharp increases in cocaine-related problems, e.g., emergency room episodes in which cocaine is the primary drug mentioned, overdose deaths related to cocaine abuse, and seizures of cocaine by the police. The skills and experience of these observers, as well as their sensitivity to what is happening in their own cities, is not subject to question. The consistency of findings speaks well for the reliability of these community-based reports.

However, two sets of existing data might lead one to question the magnitude of the reported increases and the role played by cocaine in the consequences. First, cocaine was mentioned as the "primary" drug of abuse in 6,190 out of 199,093 episodes in data from the Drug Abuse Warning Network sample of emergency rooms in 1982. As the data in table 2 show, this means that cocaine accounted for only 3.1% of all emergency room drug-related episodes. While there may have been large increases in some locales in the number of episodes associated with cocaine, overall, the magnitude of the cocaine problem evidenced in emergency room data is not large compared to the number of episodes associated with other drug classes. Furthermore, close examination of the cocaine data in table 2 indicates that for 71% of the instances where cocaine is the primary drug of abuse, at least one other drug was implicated in the episode. Stated differently, persons presenting themselves in emergency rooms in 1982 who list cocaine as the primary drug of abuse were quite likely to be abusing a number of other drugs at the same time.

Second, the Treatment Outcome Prospective Study (TOPS) is another data set that has relevance for the reported dramatic increases in cocaine use and the consequences of use. Using data from the 1979 TOPS cohort, only 125 or 3.7% of the 3,389 clients listed cocaine as their primary drug problem. As the data in table 3 show, 69% of those listing cocaine as their primary drug problem reported weekly or more frequent use of alcohol. The respective figures for weekly or more frequent use of other drugs were: marijuana, 71.5%; heroin, 27.2%; minor tranquilizers, 20.9%; and amphetamines, 22.7%. In other words, drug abuse treatment clients in the 1979 TOPS cohort who reported cocaine as their primary drug of abuse were essentially multiple drug users. This finding is clear, regardless of which drug is singled out by the clients as their primary drug problem. It is also clear that those clients who entered treatment because of heroin abuse--the largest group

= 1,439)--were not unfamiliar with cocaine in spite of its neral reputation as a very "expensive" drug. Some 42% of the roin abusers reported weekly or more frequent use of cocaine.

TABLE 2

Percent Distribution of Drug Mentions by Number of Other Drugs Used in Combination According to Drug Class: Drug Abuse Warning Network (DAWN): 1982 Emergency Room Data

Drug Class	Number of Other Drugs in Episode 0	1	2	3+	Total	Number of Mentions
Tranquilizers	30	39	25	7	100	21,968
Narcotic/Analgesics	47	31	17	5	100	22,503
Nonnarcotic/Analgesics	39	33	20	7	100	17,557
Nonbarbiturate/ Sedatives	36	34	25	6	100	14,499
Antidepressants	40	32	21	7	100	8,346
Antipsychotics	46	30	20	5	100	8,336
Barbiturates/Sedatives	25	39	29	7	100	7,256
Amphetamines	35	30	30	6	100	5,081
Hallucinogens	51	28	17	4	100	7,163
Alcohol in Combination	**	70	27	4	100	29,348
Cocaine	29	40	26	5	100	6,190
Marijuana	22	38	36	5	100	5,295
Total Drug Mentions	32	38	23	6	100	199,093

should be noted that the clients in the TOPS survey were in raditional" drug treatment modalities. They fit the prevalent ereotypical image of the heroin addict: undereducated, equently unemployed, and when employed, working in unskilled bs; involved in crime to support their habit; and involved in e use and abuse of multiple drugs. The results from the TOPS rvey support the first part of an observation made by David lth (1984, p. 5) of the Haight-Ashbury Free Medical Clinic: "In 65, cocaine was perceived as a drug of high abuse potential, nfined primarily to the hard core drug culture and closely asso-ated with heroin." The second part of Smith's observation is mewhat more tenuous and is subject to some debate: "Dramatic ifts in attitude occurred in the late 1960s and early 1970s, and e the drug is perceived in many circles as a benign substance of w abuse potential with wide acceptance through all strata of our ciety."

TABLE 3

Weekly or More Frequent Use of Various Drugs by Primary Drug of Abuse for the 1979 TOPS Cohort: An Abbreviated Table

Primary Drug of Abuse	No. of Subjects	Drugs Used Weekly or More Often					
		Alcohol	Marijuana	Cocaine	Heroin	Tranquilizers	Amphetamines
Alcohol	188	90%	63%	6%	3%	18%	27%
Marijuana	239	65%	95%	11%	4%	17%	21%
Cocaine	125	69%	72%	82%	27%	21%	23%
Heroin	1,439	53%	64%	42%	88%	21%	11%
Minor Tranquilizers	88	54%	60%	9%	8%	75%	18%
Amphetamines	125	66%	75%	13%	6%	28%	83%
	2,204*						
Totals	3,389	57%	65%	27%	45%	25%	18%

*The 2,204 subjects who listed these six drug/drug classes as their primary drug problem constitute 65% of the total number of clients in the study.

Source: Bray et al. 1982, p. 34.

COCAINE USE IN THE GENERAL POPULATION: ITS RELATIONSHIP TO USE OF MARIJUANA

Is the latter part of Smith's observation accurate in America in the mid-1980s? Has cocaine really gained wide acceptance throughout the class structure? The answer is yes if one takes seriously the following excerpt from a recent trade book on cocaine.

> When marijuana was achieving wider social acceptance during the sixties, it became the "great differentiator" in many social milieus...Cocaine has replaced the role of pot as a great differentiator and serves the same social purpose. (Stone et al. 1984, p. 15)

How seriously should such claims about the degree to which cocaine has penetrated and permeated the social mores of our society be taken? Are Stone and her colleagues correct in this claim? Or, are they extrapolating from a very select and relatively distinct part of the overall population? Is cocaine the "great differentiator" (i.e., the key factor that divides the population into one group or another) throughout the United States--in the quaint and picturesque towns and villages of New England, the Southeast, and the Midwest; in the medium and large cities located by the great rivers of this country; or even in the major metropolitan centers of this land? The answer can be found in some of the existing epidemiological surveys of drug use and I believe the answer is "No." Whether or not a person uses cocaine is simply not considered by the vast majority of Americans as the "great differentiator."

National Survey on Drug Abuse, 1982

The 1982 National Survey was the seventh in a series that began in 1971. It involved a random sample of the household population in the continental United States that consisted of 5,624 individuals 12 years old or older. The lifetime, annual, and past month rates of use of cocaine were as follows: youth 12 to 17 years old (7% lifetime, 4% past year, and 2% past month); young adults 18 to 25 years old (28% lifetime, 19% last year, 7% past month); mid-adults 26 to 34 years old (22% lifetime, 11% past year, 3% past month); and adults 35 years old or older (4% lifetime, 1.4% past year, 0.5% past month).

In this sample, as in other samples of the "general" population, use of cocaine is more prevalent among whites than nonwhites, males than females, persons who live in major metropolitan areas compared to rural areas, etc. One thing that does seem to differentiate best who will or will not use cocaine is use of marijuana.

As the data in the last column of table 4 show, the lifetime prevalence of cocaine use is markedly different in the various age groups. The most widespread use of cocaine occurs in the two groups that were 18 to 34 years old in 1982 (i.e., those born

between 1948 and 1964). These young and mid-adults represent the baby boom generation in the societal age structure. They were the ones whose passage through late adolescence and young adulthood coincided with the epidemic of marijuana use in the middle to late 1960s (O'Donnell et al. 1976).

TABLE 4

Extent of Marijuana Use Among Males by Age Group
1982 National Survey on Drug Abuse

Age Group	No Use	1-2 Times	3-10 Times	11-99 Times	100 + Times	Total
Males/Cocaine Use						
Youth (12-17 years)	*	4	4	27	60	7%
Young Adults (18-25 years)	2	4	27	44	73	35%
Mid-Adults (26-34 years)	2	3	15	35	70	26%
Older Adults (35 & older)	0	0	18	51	82	7%

*Less than .5%

It is equally clear from the data in table 4 that extent of use of marijuana is strongly related to the probability that one will use cocaine. For example, among young adult males only 2% of those who have never used marijuana have tried cocaine. The figures increase linearly, from 4% among those who have used 1 to 2 times, to 27% of those who have used marijuana 3 to 10 times, to 44% for those who have used marijuana 11 to 99 times. Of the young adult males who have used marijuana 100 times or more, 73%, almost three out of every four, report having used cocaine. The respective percentages and the pattern of findings for youth, mid-adults, and older adults are comparable in terms of the increase in cocaine use that is associated with more extensive use of marijuana. This finding is replicated in many studies (Yamaguchi and Kandel 1984; O'Donnell and Clayton 1982; Clayton and Voss 1981) using different samples and different age groups.

Monitoring the Future Studies, Class of 1980

Each year since 1975, researchers at the University of Michigan have conducted studies of drug use among public and private high school seniors from a randomly drawn sample of high schools in the continental United States. The 15,000 to 18,000 seniors representing their class complete one of five forms of a questionnaire that includes a core set of items dealing primarily with drug use and sociodemographic variables. The remainder of each form contains items covering a wide variety of substantive attitudinal and behavioral topics (Johnston et al. 1984).

The relationship between use of marijuana and use of cocaine is quite strong. Only 0.3% of seniors from the class of 1980 who had never used marijuana reported having tried cocaine. The following figures were found for cocaine use relative to extent of use of marijuana: marijuana 1 to 2 times (1.8% cocaine); marijuana 3 to 5 times (5.6% cocaine); marijuana 6 to 9 times (5.9% cocaine); marijuana 10 to 19 times (11.3% cocaine); marijuana 20 to 39 times (10.7%). Among those who reported using marijuana 40 or more times, 52.6% of the seniors in the class of 1980 reported having tried cocaine. This pattern of the marijuana-cocaine relationship replicates the relationship shown in table 4 for persons of various ages.

Extent of use of cocaine was regressed against eleven predictor variables from Form 1 of the questionnaire for the class of 1980. Sociodemographic as well as attitudinal and other behavioral variables were included in the equation (see Clayton and Ritter [1985] for a more detailed discussion of these variables). The data in table 5 show quite clearly that the two strongest predictors of cocaine use among high school seniors are extent of use of marijuana and truancy (number of days school was cut in the past month). It is interesting to note that cigarette smoking experience was the third variable to enter the equation for both males and females.

These findings have significant implications in a number of areas of the drug policy arena. For example, a substantial proportion of the drug abuse prevention efforts in place in the United States are curriculum centered and school based. It is tempting to claim that the best way to prevent drug abuse among youth is to provide them with better knowledge and skills so that their "changed" knowledge base and newly acquired skills will affect their decisions concerning drug use. This is an appealing argument. However, the data presented in table 5 indicate that the best predictors of cocaine use may be less ephemeral than attitudes and knowledge. Every school system keeps records on truancy. It is possible that special efforts to keep young people in school may have substantial value as a drug prevention strategy. The fact that cigarette smoking is a significant predictor of cocaine suggests that eliminating the privilege of smoking at school or on school property could have value as a drug prevention strategy. Certainly, when a student is "stoned" in the classroom, it is a sign for action by the school to deal with that student's drug problem.

From an epidemiological and etiological perspective, the data in table 5 imply that use of cocaine in the United States may be best understood with reference to use of other drugs, particularly the gateway drug marijuana. At the individual level an overwhelming majority of those who have used cocaine have previously used marijuana. The following scenario describes a common experience of those who have started using cocaine. A person first uses marijuana at a party or with friends. It is given to him or her as a gift. Over time, if use continues, the person's friendship group

increasingly is limited to other users. Larger and larger proportions of the person's social occasions are organized around the use of marijuana. At some point, the person will buy his or her own supply, often in order to throw a party. As time goes on, he or she will recognize that by buying in bulk it is possible to cover one's own consumption costs by selling some to friends and acquaintances. A key predictor of use of drugs such as cocaine is involvement in buying and selling (Johnson 1973; Clayton and Voss 1981). Eventually, one or both of the following will happen. The person will be invited to a party by someone in his or her drug-using network of friends and will be offered some cocaine. Or, the person's supplier of marijuana will say: "Look, you are a great customer and friend. To show my appreciation, I want to give you a present. I just got in a supply of some good quality cocaine. Try it, you'll like it!"

TABLE 5

Extent of Use of Cocaine Regressed Against Predictor Variables from Form 1 of the Questionnaire by Sex: Class of 1980 Monitoring the Future Study

Predictor Variables in the Order in Which They Entered the Equation by Sex	Beta*	b**	Value of F	Cumulative r square change
Males				
Marijuana use/lifetime	.179	.375	596.7	.213
Days cut school/past month	.172	.188	230.9	.032
Cigarette smoking experience	.075	.083	38.5	.005
Mother's education	.033	.033	5.3	.002
Mother worked while growing up	-.030	-.026	5.0	.001
Alcohol use/lifetime	-.021	-.031	4.8	.001
High school grade point	-.027	-.043	7.4	.001
Adjusted r^2 = .253 with 11 predictor variables				
Females				
Marijuana use/lifetime	.148	.359	409.2	.184
Days cut school/past month	.093	.117	78.2	.013
Cigarette smoking experience	.048	.068	17.5	.002
Father's education	.033	.048	10.2	.002
Rural-urban residence	-.014	-.029	5.3	.001
Self-perceived relative IQ	+.054	+.055	9.7	.001
High school grade point	-.013	-.024	2.2	.001
Adjusted r^2 = .203 with 11 predictor variables				

*Value of the unstandardized beta weights in a stepwise multiple regression equation with lifetime extent of cocaine use (7 categories of use) as the dependent variable.

**Standardized b values with lifetime extent of cocaine use as the dependent variable.

The data presented in tables 4 and 5 do not lend support for Smith's (1984) observation that use of cocaine has gained wide acceptance or for the claim by Stone et al. (1984) that cocaine has replaced marijuana as a major differentiating factor in American society. If anything, these data provide a powerful and persuasive argument that the best way to insure that people will never use cocaine is to prevent them from becoming heavily involved with marijuana. It is also quite clear that cocaine use is widespread, particularly among those who are in the baby boom birth cohorts. Problems resulting directly from use of cocaine are most likely to appear among young adults 18 to 25 years old and mid-adults 26 to 34 years old. These are the people in our society who are the parents of young children or adolescents. This group of mid-adults have already been through the drug epidemic of the 1960s and 1970s. What will they tell their children about drugs? How will they deal with personal decisions about the use of cocaine?

THE EPIDEMIC OF COCAINE USE: NEW USERS AND THE BLIZZARD

There are several signs of the appearance of an epidemic. The most common one is a marked increase in the number of persons having the condition who previously had been untouched by it (i.e., new users of cocaine). Another common sign is the spread of the condition into subgroups of the population that previously seemed immune to it (i.e., changes in the age at onset such that cocaine use has spread into older age groups or into the very young age groups). Another sign would be a marked increase in the number of users having problems resulting from their drug use. A final sign would be a marked increase in the annual prevalence of use of cocaine. Unfortunately, reliable data do not exist for this last sign of an epidemic of cocaine use. However, data do exist for the first three signs.

The data in table 6 show the number of new users for each year from 1954 to 1982 and the percent of all users who started using cocaine in each year, for both the 1982 and the 1979 National Surveys. The year of onset was obtained by adding the age at onset to the birth year. For the 1982 survey, there was a bulking of new cocaine users in the years 1979, 1980, and 1981. There was a 49% increase in the number of new users from 1978 to 1979. Furthermore, 47% of all the persons in the 1982 survey who had used cocaine reported that they started using in one of these 3 years. It is therefore not surprising that many seasoned observers reported the emergence of an epidemic of cocaine use in the early 1980s. An examination of the data from the 1979 National Survey reinforces the basis for the perception of an emerging epidemic of cocaine use. The bulk of new users of cocaine are found in 1977 and 1978. Some 37% of all persons who reported having used cocaine report initiation of cocaine use in one of these 2 years. In fact, there is almost a 100% increase in the number of new users from 1976 to 1977, from 54 to 105. It is important to note that by fusing these two surveys there is a bulking of new users in the 5 years from 1977 through 1981.

The evidence is reasonably clear at this time. It appears that there has been an epidemic of cocaine use in the United States. It occurred in the late 1970s and early 1980s. From the size of the increase in the number of new users across adjacent years, it is safe to say that the epidemic of cocaine use was not merely snow flurries. Whether it deserves being described as a blizzard or a snow storm requires further study. When the data are available from the 1985 National Survey, it will be possible to assess whether the epidemic is continuing, has peaked and reached a plateau, or is beginning to decline, at least in terms of "new" users. What is especially needed at this time are epidemiological data on the emergence of problems among cocaine users. How long does it take from onset of use to onset of regular or habitual use? The best estimates from clinicians indicate the hiatus commonly takes 3 or more years. Therefore, given the bulking of new cocaine users between 1977 and 1981 (see table 6), it is not surprising to hear clinicians in 1984 reporting large increases in the number of patients seeking treatment for cocaine.

The data in table 7 show the separate percentages of males and females for each age from 12 to 40 who reported having used cocaine, and their median age at onset of use. When one examines the columns for percent of users by age in 1982, two findings are apparent. First, in a large majority of the comparisons, a larger percentage of males than females report having used cocaine. Second, the percentage of users of cocaine is especially high in the young adult ages, but quite high as well among those in the mid-adult ages. Although more refined analyses are required, it is a plausible hypothesis that the epidemic of cocaine use spread rather quickly through the part of the population already vulnerable because of prior involvement with marijuana, i.e., those in the baby boom cohorts. The columns on median age at onset for the mid-adults and older adults suggest that initiation of cocaine use may be primarily an adult phenomenon. One of the problems with median age at onset data is that they are limited by the age of the respondents.

Another problem is the size of n for computation of the medians. Still another is the effect of outliers on the medians when the number of users in a birth cohort is relatively small. One or two people with very low ages at onset can pull the overall median down considerably. With these caveats in mind, the data in table 7 do suggest the appearance of an epidemic of cocaine use that is more historical than individually developmental.

CHARACTERISTICS OF COCAINE USERS: ARE WE BEING SNOWED?

As noted earlier in this paper, the media seem to exert a tremendous influence on how social problems are defined and on our understanding of the parameters of these problems. The image that has been created for cocaine is that it is the "champagne" of drugs. This has as much to do with who we think is using it as it does with its presumed high price. Stories about cocaine imply that use of this drug is considerably more likely to occur the higher one's education, income and occupational prestige. Are we being snowed into thinking that cocaine is a glamour drug?

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TABLE 6

Number of New Users of Cocaine and Percent of All Users of Cocaine Who Started That Year: 1982 and 1979 National Surveys on Drug Abuse

Year of Onset of Cocaine Use	1982 National Survey		1979 National Survey	
	No. of New Users of Cocaine	Percent of Users Starting This Year	No. of New Users of Cocaine	Percent of Users Starting This Year
1982	33	5		
1981	103 (*******)	16		
1980	104 (*******)	16		
1979	96 (*******)	15	50	8
1978	59	9	122 (*******)	20
1977	59	9	105 (*******)	17
1976	45	7	54	9
1975	34	5	63	10
1974	30	5	53	9
1973	23	3	53	9
1972	15	2	35	6
1971	9	1	18	3
1970	13	2	16	3
1969	6	1	10	2
1968	13	2	10	2
1967	3	*	6	1
1966	2	*	7	1
1965	6	1	1	*
1964	4	1	5	1
1963	0	0	0	0
1962	3	1	0	0
1961	0	0	1	*
1960	0	0	2	*
1959	0	0	1	*
1958	0	0	3	1
1957	0	0	0	0
1956	0	0	1	*
1955	0	0	0	0
1954	0	0	3	*
Weighted n = 661			619	

Note: The years which produced the largest number of new users of cocaine are connected by the following notation: (*******).

*Less than .5%

TABLE 7

Percent Who Had Ever Used Cocaine and Median Age at Onset of Use of Cocaine by Sex and Age: 1982 National Survey on Drug Abuse

Age in 1982 by Age Groups	Males		Females	
	Percent Used Cocaine	Median Age at Onset	Percent Used Cocaine	Median Age at Onset
Youth				
12	*	*	*	*
13	*	*	*	*
14	3	11	2	13
15	7	14	6	14
16	8	14	10	15
17	15	16	18	16
Young Adults				
18	10	16	12	16
19	26	17	19	17
20	37	19	18	18
21	46	18	27	18
22	40	18	30	19
23	31	19	24	20
24	42	20	19	20
25	37	20	24	22
Mid-Adults				
26	33	22	17	20
27	22	23	25	23
28	38	21	20	24
29	32	21	26	23
30	32	21	13	26
31	*	*	13	28
32	20	26	25	30
33	16	29	7	27
34	17	25	15	32
Older Adults				
35	31	31	2	32
36	35	23	5	33
37	32	20	13	32
38	22	35	*	*
39	5	25	*	*
40	21	20	17	38

*Medians were not computed for any age group in which the number of users of cocaine was less than 10.

If cocaine use is correlated with educational attainment and other indices of social class, there should be an almost linear increase in the percentage reporting having used cocaine as one reads down each set of percentage figures in table 8. Use of cocaine does seem to be related to educational attainment. The two groups with the largest percentage of users are those with some college and those with a baccalaureate or higher degree. The two lowest groups are those who never finished high school. The employed are considerably more likely than the unemployed to report having used cocaine. Among those who are employed, managers have the largest percentage of users (26.6%), followed by skilled workers (19.6%), service workers (18.3%), and then by professionals (17.1%). Thus, the distribution of cocaine use by employment type does not support the perception that cocaine use is considerably more prevalent among professionals. Among those who were unemployed in the month preceding the survey, the lifetime prevalence of cocaine use is considerably higher among students and those truly unemployed than it is among housewives. There is certainly no linear relationship between reported family income and lifetime prevalence of cocaine use. The groups with the largest percentage of cocaine users are those making $50,000 or more and those making between $10,000 and $20,000. The rate of cocaine use in the highest income category does lend some support for the idea that the drug is associated with wealth. However, the rather small overall differences in the rates of use from one income category to another suggest that too much has been made of the association of cocaine use with various indices of "success." Simply put, these data from a cross-section of American adults suggest that there may be more snow than fact in the picture provided by the popular media of the common characteristics of cocaine users.

CONCLUSIONS

What is the bottom line on cocaine use in the United States in the 1980s? Are we in the midst of a blizzard or are we being snowed? In formulating answers to this question I am reminded of one of my favorite children's stories, the one about the blind men of Hindustan who encountered an elephant. Each one felt a different part of the elephant and proceeded emphatically to claim that the "entire animal" was like the part he touched. Are we not in a similar position in describing cocaine use in the United States? With this children's story in mind, the following conclusions and observations seem warranted.

1. All of us are examining data that represent valid appraisals of the situation. However, we are seeing different parts of what may be a very big animal. The clinicians are encountering a part of the population in which cocaine use and its consequences are most apparent. The epidemiologists cast a broader net and are thus encountering a broader range on the usage continuum. Because of this, the epidemiologists are prone to provide somewhat more conservative estimates of the extent of the cocaine problem.

TABLE 8

Percent Who Have Ever Used Cocaine by Education, Employment Last Month, Employment Type, Status if Unemployed Past Month, and Family Income: 1982 National Survey on Drug Abuse (Adults Only)

Social Variables That Might Predict Cocaine Use	Weighted N	Percent Ever Used Cocaine
Education		
8th grade or less	596	1.3
Some high school	764	7.6
High school graduate	1,520	12.1
High school plus vocational	183	11.3
Some college	928	19.0
College graduate	870	18.8
Employed Past Month		
Yes	2,904	17.5
No	2,004	5.6
Employment Type		
Laborer	184	13.9
Service worker	330	18.3
Semiskilled worker	290	14.0
Skilled worker	437	19.6
Retail/office worker	472	10.9
Manager	388	26.6
Professional	753	17.1
Status if Unemployed Past Month		
Housewife	790	3.0
Student	159	27.2
Unemployed	192	15.4
Retired	668	-
Disabled	130	8.4
Family Income		
None	23	23.5
Under $10,000	1,185	10.6
$10,000 - $19,999	1,192	15.3
$20,000 - $29,999	931	13.8
$30,000 - $39,999	560	13.0
$40,000 - $49,999	292	10.0
$50,000 or more	308	15.7
No answer	212	6.8
Not sure	209	6.4

2. There is probably more convergence across the studies of different populations regarding the use and abuse of cocaine than is apparent at first glance. In fact, there is a remarkable amount of consistency in what has been reported by the clinicians in the papers in this volume. An even greater degree of similarity exists in the findings reported by the epidemiologists. It is worth noting that, from a methodological perspective, the only way to simultaneously reduce the probability of making both Type I and Type II errors is to replicate findings across studies. The degree to which findings are replicated across the studies reported on in this volume is impressive.

3. There is a tendency to think of drug epidemics in monolithic or dichotomous terms. The society is either in or not in an epidemic. The epidemic has either stopped or it is still occurring. We are limited by the primitive nature of our conceptualization of epidemics. Drug epidemics are usually described in unidimensional and real time terms. In fact, an epidemic of drug use is best described in processual, contextual, and multidimensional terms. An epidemic of drug use penetrates various sectors of society and segments of the population with differing degrees of ease and intensity and coverage. Because of history and other factors, some segments of the population may be significantly more vulnerable to an epidemic of cocaine use than other segments. Thus, use of cocaine may spread like wildfire in some areas while in other areas it may take years for the infection to reach even a small percentage of the population.

4. Treatment data and data from the cocaine hotline suggest that there is a rather long hiatus between onset of cocaine use and the appearance of significant health or life-threatening episodes resulting from cocaine use. This hiatus is probably in the range of 3 to 5 years. The epidemiological data presented by Abelson (this volume) suggest that the slope of increase in the incidence and prevalence of cocaine use has slowed down or flattened out. It may well be true that the increases in the number of clients seeking treatment for cocaine represents the FRONT end of a longer line of people. These are the people who have used cocaine long enough to progress far enough to have problems. If the average hiatus is from 3 to 5 years, the appearance of large numbers of new cases in treatment centers may be imminent (see data in table 6). How long is the queue behind this first batch of persons entering the treatment system who are experiencing negative consequences attributable to their use and abuse of cocaine?

5. If the price of cocaine remains low or drops even lower and the purity remains high or goes even higher, this society may experience an epidemic of cocaine use without historical equal in terms of magnitude and coverage. Even if the price-purity balance does not worsen, the tentacles of the cocaine epidemic in the United States may have considerably more capacity for

expansion. As indicated at the beginning of this paper, there are at least 550,000 Americans who are seriously at risk for exhibiting negative consequences of cocaine abuse. This is probably a conservative estimate of the number of problem users in the United States. A much larger number are already at risk for continuing use or progressing toward abuse of cocaine. The percentage of all users who make the transition from nonuser to user and then from user to abuser of cocaine may be affected by the price-purity ratio. From a public health perspective, far too many Americans have already used cocaine, far too many continue using cocaine, and far too many abuse it. Considerably more must be done to reduce the demand for cocaine.

6. Given the prodigious amounts of money that accompany trafficking in cocaine and the precarious financial situation in the major cocaine producing and distributing countries, it would not be surprising to see new countries entering the lucrative cocaine trade. We know from economics that an increase in supply will produce a drop in price and a rise in purity. Most of the research scientists studying cocaine use do so from a "demand reduction" perspective. If greater attention is not devoted to the "supply reduction" part of the policy continuum, the problems now being encountered with cocaine in the United States may appear small in retrospect 5, 10, or 15 years from now.

WHAT CAN BE DONE? The sad truth is that there is no simple answer to this question. However, there are several "minimal" steps that must be taken. First, a viable campaign must be mounted to inform the American public of the myths surrounding cocaine, its effects, and who uses it. Cocaine must be demythologized!

Second, a sense of realism and caution must be exercised with regard to the development of successful treatment regimens for cocaine abusers. It is one thing to claim a remarkable level of success with cocaine abusing patients, it is quite another thing to conduct a rigorous treatment outcome study. It would be prudent to temper claims of treatment success with caveats until credible research results have been compiled.

Third, use of cocaine is a complex behavioral phenomenon that cannot be understood if taken out of context. A substantial majority of cocaine users and abusers use and abuse other drugs as well. The data presented in this paper suggest that use of cocaine is integrally connected to use of marijuana. Further, cocaine is often used simultaneously with other drugs, particularly alcohol and marijuana, so that these other drugs can moderate or modify the effects of cocaine on the user. We must resist the temptation to single out cocaine as if it is a totally unique drug. An equally powerful temptation is to treat cocaine users as if they are unlike users of other drugs. The data presented in this paper provide convincing evidence that cocaine is another drug and that its use and its users can be best understood with reference to their drug-using behavior, not just their use of cocaine.

ourth, there is an urgent need for more collaborative efforts cross disciplines within the community of scholars who specialize n studying and treating drug users. This could and should be acilitated by the National Institute on Drug Abuse following a arefully constructed multidisciplinary research agenda centered round cocaine, but not limited exclusively to it.

ifth, from a public policy perspective, it is important to recog- ize that history is often an excellent teacher. Around every orner turned in the war on drugs is usually another long, dark allway and then, another corner.

inally, we must be reminded that the numbers don't lie. The data n this paper indicate that over half a million Americans may be eriously at risk for exhibiting negative consequences from their buse of cocaine, and many many more are at risk for continuation f use or progression to abuse of cocaine. These and other num- ers we are so fond of citing and noting represent real people. n this instance, they are people who are hurting, people who need ur help, our concern, our understanding, and our love.

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A Decade of Trends in Cocaine Use in the Household Population

Herbert I. Abelson and Judith Droitcour Miller

INTRODUCTION

The National Survey on Drug Abuse provides data on current trends and current prevalence, as well as patterns and correlates of drug use for a broad spectrum of substances. The National Survey is a series of nationwide studies that began in 1971 and 1972 under the sponsorship of the National Commission on Marihuana and Drug Abuse and conducted by Response Analysis Corporation. Then, from 1974 through 1982, five subsequent National Surveys were conducted jointly by The George Washington University and Response Analysis Corporation, sponsored by the National Institute on Drug Abuse.

Each of these surveys has utilized a National Area Sample. The sample design insures that each household in the coterminous United States has a known chance of selection. Sample households in the locations for the study are predesignated and a sample of youth and a sample of adults are identified from among the designated households. The sample designs have included disproportionate sampling of youth, ages 12 to 17, and young adults, ages 18 to 25.

The data are based on self-reports collected by face-to-face interviews with designated respondents. The National Survey utilizes a variety of data collection procedures. Information about cocaine and other drugs has been elicited by means of a technique in which respondents mark private answer sheets in response to questions from interviewers. The survey procedure calls for elaborate and conspicuous precautions to insure respondent privacy.

Response rates, which are one estimate of data quality, have followed contract requirements, from about 70% in earlier surveys to 80% or more in the 1979 and 1982 surveys.

Each of the last six National Surveys has included some kind of methodological study or experiment as part of its design.

Table 1 shows the number of completed interviews for each of the surveys for which there are data on cocaine.

TABLE 1

Completed Interviews, Six National Surveys*

	1972	1974	1976	1977	1979	1982
Youth (12-17)	880	952	986	1,272	2,165	1,581
Younger Adults (18-25)	772	849	882	1,500	2,044	1,283
Older Adults (26+)	1,613	2,221	1,708	1,822	3,015	2,760

*The 1971 National Survey includes no data on cocaine.

This chapter reviews some of the data on cocaine from the National Surveys. Starting with a status report from the most recent National Survey, the paper goes on to trends in usage since 1972 among the high-risk 18 to 25 population, and then to trends for other age groups. There are also our observations on possible sources of error in the data.

Parts of the chapter are concerned with correlates of cocaine use: first order demographic data which can be both crude and enlightening; and observation on concurrent and multidrug use.

COCAINE PREVALENCE

Starting with the most recent prevalence figures from the 1982 National Survey, 20 million or more Americans report having at least tried cocaine--and about half of that number report having used cocaine within the past 12 months.

Table 2 shows that large numbers of youth and adults in these age groups have by now tried cocaine. Looking at the population projections, about 1 1/2 million youth have tried cocaine, as have 9 million young adults and over 10 million persons age 26 and older. The larger proportion of the older adult users are in the 26 to 34 age group.

Percentage-wise, as well as in terms of past-year and past-month use, the highest risk population is clearly the 18 to 25 age group: about 19% of the respondents in this age group say they have used cocaine within the year prior to the survey interview. And, about one-third of these persons--nearly 7% of the entire age group--report using cocaine during the past month.

TABLE 2

Prevalence Estimates and Population Projections (1982)

	Ever Tried	12 Months	Past Month
Youth 12-17 (1,581)	6.5% 1,490,000	4.1% 940,000	1.6% 380,000
Younger Adults 18-25 (1,283)	28.3% 9,260,000	18.8% 6,150,000	6.8% 2,230,000
Adults 26+ (2,760)	8.5% 10,820,000	3.8% 4,810,000	1.2% 1,550,000
Older Adult Age Groups:			
26-34	21.7% 7,060,000	10.8% 3,510,000	3.3% 1,080,000
35+	4.0% 3,760,000	1.4% 1,300,000	0.5% 470,000

COCAINE TRENDS

Tracing cocaine trends in the young adult population over the past decade reveals three patterns that are shown in figure 1.

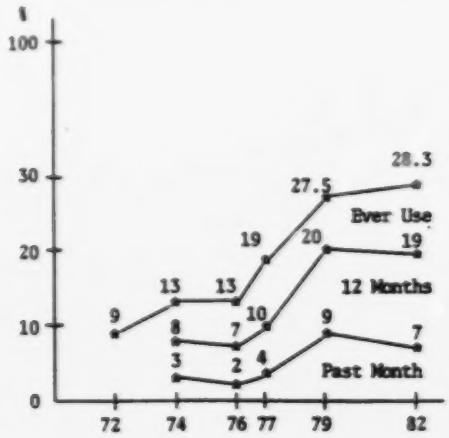

FIGURE 1

Trends in prevalence for adults ages 18 to 25

From 1972 to 1976, there was relatively low prevalence and comparative stability. For example, the percentage of young adults reporting that they had ever tried cocaine went from 9% in 1972 to 13% in 1974 and 1976. Then, between 1976 and 1979, there were dramatic increases in prevalence. From 1976 to 1977 to 1979, lifetime prevalence increased from 13% to 19% to 27.5%--thus, doubling in a period of 3 years. During these years, trends in past-year and past-month cocaine use were equally dramatic. From 1976 to 1977 to 1979, past-year prevalence increased from 7% to 10% to 20%, and the percentage reporting past-month use went from 2% to 4% to 9%.

More recently, between the 1979 and 1982 National Surveys, there has been a leveling off of the cocaine trend lines. During this period, the high prevalence levels of the late seventies have, for the most part, been maintained. This is the picture for the 18 to 25 population group.[1]

Discussion

Why the sharp rise in reported usage between 1976 and 1979? First, of course, higher proportions of the population have had experience with cocaine. And as a corollary to experience, we assume that the substance must have been more widely available during these years than previously. However, other dynamics, which are also observed in consumer response to other, less exotic products, may be occurring here.

One is a response to increased name awareness. A higher proportion of the population may have been familiar with cocaine in 1979 than in 1974. This, in turn, may facilitate a second artifact, mistaken identity or "look alikes." As the drug becomes more widely adopted, more people may think that what they are using is cocaine, and it may not always be so. And third, of course, is whatever component of social desirability there may be in having an answer sheet know that you are using cocaine.

One source of reassurance--or despair--is to compare data which have been collected independently from a comparable population. We turned to Johnston's annual studies of high school seniors to compare trends in use of cocaine between 1976 and 1979.[2] Johnston's high school seniors and the National Survey cohort of young adults are roughly comparable, but by no means identical. Johnston's data show the same trends as those which we have been examining. This could mean that responses in both surveys reflect some of the same types of errors. It is more likely, however, that reported behavior about the use of cocaine--and other drugs--mostly reflects actual experience, and that nonsampling sources of error contribute in only a minor way. We find these possible sources of error useful to keep in mind when examining survey data.

There is a parallel in the trends for cocaine and marijuana use among young adults, although the years of maximum growth recorded by the National Surveys are different for each drug. The most

rapid years for increased use of marijuana were probably the late sixties and early seventies. The 1971 and 1972 National Surveys caught the "tail end" of what might be termed a wave of a drug use epidemic. For example, between 1971 and 1982, the percentage of young adults who had tried marijuana went up from 39% to 48%, and current prevalence followed from 17% to 28%. During the mid-seventies, the National Survey data show relatively little change. During this period, 1972 to 1976, roughly half of young adults reported ever using marijuana, and approximately half of those reported current use. This midseventies plateau was also seen for cocaine, but at a different level of adoption.

Starting in 1976, experience with both drugs reflected the beginning of another dramatic rise, with both cocaine and marijuana reaching their highest prevalence levels in 1979. The prevalence estimates from the 1982 National Survey document another plateau for both drugs.

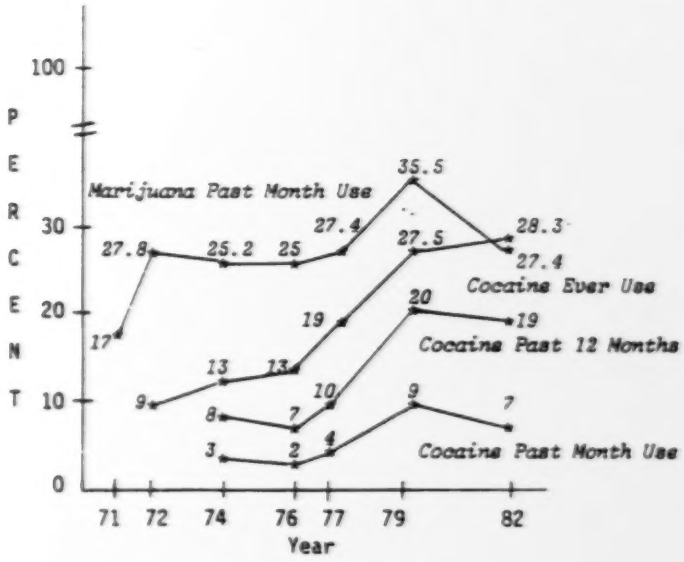

FIGURE 2

Marijuana: Past month use, and cocaine: Three types of prevalence for adults 18 to 25

Figure 2 is figure 1 with 30-day marijuana prevalence added at the top. The bottom trend line is the complete one for cocaine. The prevalence parallels are readily apparent.

As we have just suggested, the Johnston studies of high school seniors evidence the same pattern of plateau and increase for both cocaine and marijuana as do the young adult national samples. Thus, the pattern of stability and change in cocaine use during the 1970s appears to be part of a larger drug use picture among young adults. For cocaine and marijuana, and perhaps for other drugs as well, the plateau revealed by the 1982 National Survey data may indicate a permanent leveling off of usage, or it may follow the observed pattern throughout the 1970s of leveling off followed by another increase.

A comparison of trends in lifetime prevalence of cocaine use for three ages groups from 1972 to 1982 is shown in figure 3.

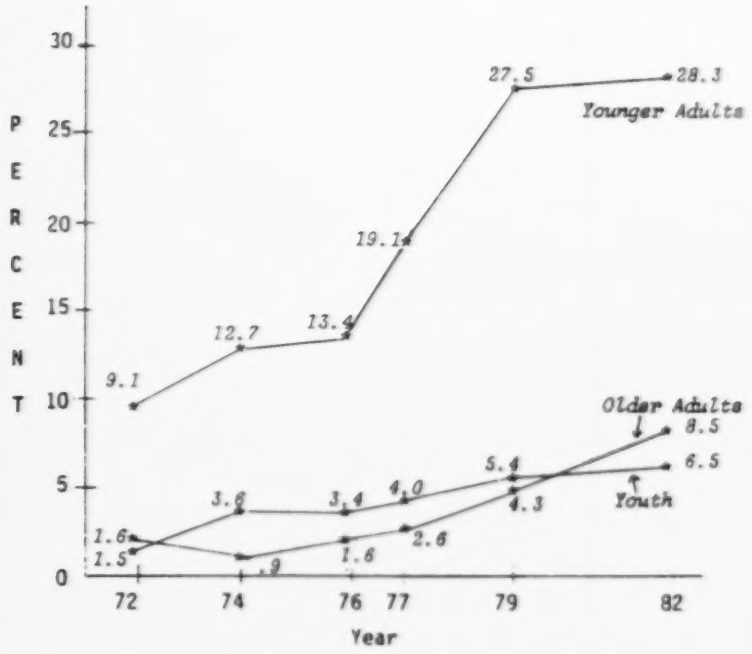

FIGURE 3

Trends in lifetime prevalence of cocaine use for three age groups (1972-1982)

For the youth population, increases have occurred during the decade; for example, in 1972, only 1.5% of the 12 to 17 age group reported having tried cocaine. During the midseventies, this figure increased to about 3.5% or 4%, then went up to about 5.4% in 1979 and 6.5% in 1982. Thus, there have been relatively small changes for any one interval, but the general pattern is one of increasing exposure of youth to cocaine.

For the older adult population, prevalence rates have been consistently low and there was little change until the late seventies. About 2% of older adults reported experience with cocaine until the 1979 and 1982 surveys when the lifetime prevalence figure for the population aged 26 and older increased from about 2.6% to 4.3% and then to 8.5% in 1982.

As reflected in table 2, which shows percentage and projections for three age groups, most of the older adult cocaine users are in the 26 to 34 age group. Obviously, these persons were ages 18 to 25 during the mid-1970s. An examination of cohort patterns, from data on reported age at the time of first use of cocaine, suggests that older adult trend lines are the result of the maturation of key cohorts. In other words, during the midseventies many young adults began using cocaine; those young persons have now passed their 26th birthdays and are in the 26 to 34 age cohort. So, while some new cocaine use does occur among persons over 25 years of age, much of the recent increase in prevalence for older adults reflects the earlier expansion of cocaine in the young adult population.

As table 3 shows, between the 1979 and 1982 surveys, the projected number of youth and young adults who had ever tried cocaine did increase somewhat, but the most dramatic increases are in the older age groups.

TABLE 3

1979-1982 Projections for Lifetime Prevalence

	1979	1982
Youth 12-17 (1,581)	1,260,000	1,490,000
Adults 18-25 (1,283)	8,700,000	9,260,000
Older Adults (2,760)		
26-34	4,040,000	7,060,000
35+	1,150,000	3,760,000

Even if the present cocaine plateau continues for young adults, the passage of the birth cohorts into the older population will result in greater and greater numbers of adults who have tried cocaine--

and at least some of these persons will continue some level of cocaine use as they move into the older age ranges. In other words, even if there is no increase in risk to younger population age groups, the total number of persons who have used and are using cocaine can be expected to increase in coming years.[3]

CORRELATES OF COCAINE USE WITHIN THE 18 TO 25 COHORT

Table 4 shows that within the 18 to 25 cohort in the 1982 National Survey, above-average cocaine prevalence rates exist for a number of population subgroups.

TABLE 4

Prevalence Data Among Geographic Subgroups of Younger Adults (1982)

	Ever Tried	12 Months	Past Month
Adults 18-25 (1,283)	28.3%	18.8%	6.8%
Population Density			
Large Metropolitan (374)	35.0%	24.0%	10.0%
Small Metropolitan (472)	27.0	18.0	6.0
Nonmetropolitan (437)	22.0	13.0	5.0
Region			
Northeast (251)	35.0%	25.0%	13.0%
North Central (310)	25.0	13.0	3.0
South (494)	21.0	12.0	4.0
West (228)	38.0	30.0	9.0

Geographically, young adults who live in large metropolitan areas, and those who live in the northeastern and western regions of the country are more likely than others to have had experience with cocaine. For example, 35% of the young adults in large metropolitan areas have now tried cocaine and 24% report past-year use. These rates are considerably higher than those for nonmetropolitan areas. Turning to regional data, 38% of young adults who live in western States have tried cocaine and 30% report use in the past year. These rates are high in comparison with the South and Midwest.

The geographic patterns are generally similar to what is observed for young adult marijuana use--at least, the lower the population density, the lower the drug use rate. However, regional differences are dwindling for marijuana. And, again, these geographic

patterns are strikingly similar to those reported by Johnston et al. for high school seniors.

Continuing this demographic examination, table 5 describes past-year and past-month prevalence rates for young men and young whites, which are about twice as high as those for women and non-whites.

TABLE 5

Prevalence Data Among Sex, Race, and Educational Groups of Younger Adults (1982)

	Ever Tried	12 Months	Past Month
Adults 18-25 (1,283)	28.3%	18.8%	6.8%
Sex			
Male (574)	35.0%	25.0%	13.0%
Female (709)	22.0	13.0	5.0
Race			
White (1,106)	30.0%	20.0%	7.0%
Black and Other (174)	18.0	10.0	3.0
Education			
Not High School Graduate (242)	23.0%	15.0%	4.0%
High School Graduate (545)	28.0	17.0	6.0
Completed 1-3 Years of College (327)	30.0	20.0	7.0
College Graduate (151)	34.0	27.0	13.0

And, finally, prevalence rates increase with education level, going from, for example, 15% for past-year use among those who are not high school graduates to, at the other end of the scale, 27% for those who are college graduates. Of course, for this age group education is not as clear a measure of socioeconomic status (SES) as it is for older persons--simply because many 18 to 25 year olds are still in school or may have temporarily dropped out.

The demographic pattern for cocaine does not hold when we look at marijuana. For example, among young adults who are not high school graduates there is different usage for the two drugs: 4% report past-month cocaine use, whereas 35% report past-month marijuana use. However, for young adults who are college graduates, past-month prevalence rates are closer for the two drugs: 13% for cocaine and 19% for marijuana.[4]

In sum, the demographic profile of cocaine use among young adults includes residence in large metropolitan areas, residence in the northeast or western part of the country, and being male, as well as white and college educated. The geographic correlates and the sex pattern are generally consistent with what we have observed for marijuana. But the race and education data from the 1982 survey present a reverse pattern.

PATTERNS OF CONSUMPTION AND THE DRUG USE CAREER

Turning to patterns of cocaine consumption, first, the cocaine user is an occasional user. Looking first at lifetime frequency (table 6), that is, the total number of times that a person has used cocaine during his or her life, most young adults who have tried this drug stop short of using it on 100 or more occasions.

TABLE 6

Lifetime Frequency of Cocaine Use by Young Adults (1982)

Base: 1,283

Once or twice	7.4%
3 to 10 times	9.2
11 to 99 times	9.1
100 or more times	2.5
Total Ever Used	28.2%

Seven percent of the age group or about one-fourth of the young adults who have tried cocaine say they have used the drug only one or two times in their lives. The rest of the ever-users are about equally divided into those who have used 3 to 10 times and those who have used 11 to 99 times. Only 2.5% of the age group, or roughly 1 in 10 ever-users, say they have used this drug on 100 or more occasions.

Just as a point of comparison, if we look at the same data for marijuana, the model category for young adult marijuana use would be 100 or more times, and the least likely outcome would be 1 or 2 times. For young adults, 9.5% used marijuana 1 to 2 times in life; 12.6% used 3 to 10 times; 17.4% used 11 to 99 times; and 24.0 used 100 or more times.

In terms of frequency of cocaine use within the past 30 days, most current cocaine users have consumed this drug on just 1 or 2 days out of the past 30 (table 7). Again, at least as compared to marijuana, cocaine appears to be a drug of occasional use. (Fewer than one-third of current marijuana users in the young adult group report use on just 1 or 2 days out of the past 30.)

TABLE 7

Frequency of Cocaine Use in Past 30 Days
by Young Adults (1982)

Base: 1,283

1 or 2 days	4.3%
3 or 4 days	1.0
5 to 19 days	1.3
20 or more days	*
Total past month users	6.6%

*Less than .05%.

Second, the cocaine user is a multidrug user. As has been indicated in several studies, notably Kandel and her colleagues (this volume), a young person typically tries cocaine only after he or she has already used marijuana as well as alcohol and cigarettes. Virtually all current cocaine users are also current alcohol users, and the majority of these current cocaine-and-alcohol users are also current marijuana users. In fact, the experience of the current cocaine user is in many cases dominated by the use of alcohol and marijuana rather than by cocaine.

Comparing the number of days on which concurrent cocaine and marijuana users say they consume each of these drugs, three-fourths of these dual users say they use marijuana on more days than cocaine. Then, comparing the number of use days for concurrent cocaine and alcohol users, nine-tenths say they drank alcohol on more days (out of the past 30 days) than they used cocaine. Turning to combined use, in the 1982 survey, marijuana users were asked to report how often they had combined alcohol with marijuana. Similarly, cocaine users were asked how often they had combined cocaine with marijuana.

The specific question on alcohol with marijuana was: "On the occasions when you have used marijuana or hash, about how often did you use alcohol at around the same time?" Interviewers explained that "around the same time" means within a couple of hours of each other. A similar question was asked about marijuana with cocaine use. Table 8 describes the results.

About one-third of the 18 to 25 age group who have ever tried cocaine report that they combined it with marijuana every time that they used it. Moreover, it turns out that many of those reporting infrequent combined use or no combined use are the cocaine users who had used the drug fewer than 10 times. So that when only experienced cocaine users are considered (that is, only those who

have used cocaine more than 10 times), the distribution shifts so that a majority of the more experienced users fall into the first two categories shown here, i.e., at least half-the-time they have combined marijuana with cocaine.

TABLE 8

Marijuana Use With Cocaine Use, Young Adults (1982)

Base: 1,283

Nearly every time I used cocaine	9.6%
About half the time I used cocaine	2.7%
Occasionally/rarely	7.7%
Never both at once	8.2%
Ever used cocaine	28.3%

A comparable situation exists with respect to marijuana and alcohol use. That is, a good proportion of the experienced marijuana users say that usually or at least half-the-time that they use marijuana, they also use alcohol.

Thus, the young adult who uses cocaine is likely to be an occasional cocaine user who consumes alcohol and marijuana more frequently than he or she uses cocaine. As a multiple drug user, he often uses more than one drug on the same occasion.

SUMMARY

The National Survey provides us with a number of realities about cocaine use in the Nation today:

Twenty million or more Americans have now tried it, and half of that number are past-year users.

Cocaine use tends to be concentrated in the high-risk 18 to 25 population group.

The highest prevalence rates are observed in young white males, in young residents of the West and the Northeast, and among white and college-educated young people.

The young adult cocaine user is likely to consume this drug occasionally and to be a more frequent user of alcohol and/or marijuana. It is not unusual for him or her to use marijuana in combination with cocaine.

With respect to recent trends, even though dramatic increases in cocaine prevalence among young adults have leveled off, this still means that high levels of cocaine use are being maintained by

young Americans. Moreover, small but steady increases in prevalence are continuing for the youth population. And, the overall number of Americans who have used and are using cocaine continues to increase as new cohorts of young persons begin and continue the use of this drug--even as they move into the older age ranges.

OBSERVATIONS

The pattern of data on cocaine use since 1972 suggests that the concept "plateau" is a more faithful descriptor of periods of little change than is the concept "stability." During the years of National Survey measurement, cocaine and other drug use has not stabilized, it has only shown a tendency to either smaller or larger increases from one measurement to the next.

Until the availability of the 1985 National Survey findings, we are cautious about concluding that there will be no more increases in cocaine use. Much depends upon (1) whether there is a new consumer segment whose use of marijuana and alcohol is preparing them to be susceptible to cocaine; (2) whether the positive image of cocaine among young people can be changed, and the true nature of the drug communicated to high school students and young adults; and (3) the availability and cost of the drug itself.

FOOTNOTES

[1]It is our understanding that the cocaine available for buys has been increasing in purity (i.e., strength) over the past several years, which is one of the variables not accounted for by prevalence data.

[2]Johnston, L.D.; Bachman, J.G.; and O'Malley, P.M. Student Drug Use, Attitudes, and Beliefs, National Trends 1975-1982. National Institute on Drug Abuse. DHHS Pub. No. (ADM) 83-1260. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1982. Another paper prepared for this volume by Patrick O'Malley extends the Michigan data another year; cocaine has remained on a plateau through the 1983 measurement.

[3]This conclusion suggests that National Survey data in future years include more refined age intervals than have been presented up to now.

[4]Income data are difficult to interpret for this age group; many young adults are living with their parents and report parents' income (perhaps in addition to their own) as household income. Others are living on their own and may be attending school. Still others may be working in what is to be their lifetime career, but early salary may not reflect career potential. SES data in this age group should ideally be based on a combination of education, income, living circumstances, and occupation.

[5]Caution to the reader. Lifetime frequency data seem to be a staple of epidemiological studies like the National Survey. We question the validity of the upper end of such data (e.g., "more than 100 times"). Respondents who have maintained a consumption rate may be able to report accurately. Other respondents are not reporting their behavior as much as they are reflecting their self-images (e.g., "I am the kind of person who uses cocaine more than 100 times in my life, so this is the category for me.") Obviously, questions which ask for behavioral but invite attitudinal responses, also invite misinterpretation of their meanings.

REFERENCES

Figure 1: National Survey on Drug Abuse, Main Findings, 1982. Table 6 (p. 17), Table 9 (p. 10), and Table 12 (p. 23).

Figure 2: National Survey on Drug Abuse, Main Findings, 1982. Table 6 (p. 17), Table 9 (p. 10), and Table 12 (p. 23).

Figure 3: National Survey on Drug Abuse, Main Findings, 1982. Table 35 (p. 51).

Table 2: National Survey on Drug Abuse, Main Findings, 1982. Table 33 (p. 49). Population Projections, Based on the National Survey on Drug Abuse, 1982. Tables 5A and 5B.

Table 3: Population Projections, Based on the National Survey on Drug Abuse, 1982. Tables 5A and 5B. Population Projections, Based on the National Survey on Drug Abuse, 1979. Tables 4A and 4B.

Table 4: Main Findings of the National Survey on Drug Abuse, 1982. Table 34 (p. 50).

Table 5: Main Findings of the National Survey on Drug Abuse, 1982. Table 34 (p. 50).

Table 6: Main Findings of the National Survey on Drug Abuse, 1982. Table 36 (p. 52).

Table 7: Main Findings of the National Survey on Drug Abuse, 1982. Table 36 (p. 52).

Table 8: Main Findings of the National Survey on Drug Abuse, 1982. Table 36 (p. 52).

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Cocaine Use Among American Adolescents and Young Adults

Patrick M. O'Malley, Lloyd D. Johnston, and Jerald G. Bachman

INTRODUCTION

This chapter reports data on the prevalence of cocaine use, and related attitudes and beliefs, among American adolescents and young adults. Some of the results have been reported elsewhere, as part of a series reporting on the use of a variety of licit and illicit drugs (Johnston et al. 1984b). Here, the data on cocaine use specifically have been collated, and some new data related to cocaine use are reported.

STUDY DESCRIPTION

The Monitoring the Future project is an ongoing study conducted by the Institute for Social Research at the University of Michigan. The study design is described in detail by Johnston et al. (1984a); briefly, it involves nationally representative surveys of each high school senior class, plus followup surveys mailed each year to a subset of each senior class sample. This design is called a cohort-sequential design, one in which multiple cohorts are followed over time.

Sampling and Survey Procedures

A three-stage national probability sample leads to questionnaire administrations in about 130 high schools (approximately 110 public and 20 private), and yields between 15,000 and 19,000 senior respondents each year. The response rate is generally about 80% of all selected seniors. From each senior class sample, 2,400 individuals are selected for followup, randomly divided into two equal sized groups. The 1,200 members of one group are invited to participate in the first year after graduation, and every 2 years after that; those in the other group are invited to participate in the second year after graduation, and every 2 years after that. Respondents are paid $5 for each participation. Generally speaking, followup rates have been around 80% of the original group, producing approximately 1,000 questionnaires per followup per class.

PREVALENCE OF USE IN 1983

In 1983, about one in every six seniors (16.2%) report having used cocaine at some time in their lives. Annual prevalence--any use in the past 12 months--is 11.4%, and monthly prevalence--any use in the past 30 days--is at 4.9%. The percentage reporting use on a daily or near-daily level in the prior month (use on 20 or more occasions) is 0.2%. In fact, less than 2% (1.7%) report use on more than two occasions during the month. Although 16% of seniors report having tried cocaine, almost half (7.5%) have used it only once or twice; and only 2.3% report having used cocaine 20 or more times in their lives.

In sum, although cocaine use has been getting a great deal of attention, it is not anywhere near a "common" behavior among high school seniors. This is not to say that there is no reason for concern. The fact that one in six seniors has tried the drug, given its high abuse potential, is reason enough for concern. In addition, the high cost of cocaine, which probably helps account for its relatively low frequency of use, may be decreasing.

TRENDS IN PREVALENCE

As figure 1 shows, from 1976 to 1979 cocaine exhibited a dramatic and accelerating increase in use: annual prevalence rose from 6% in the class of 1976 to 12% in the class of 1979, a twofold increase in just 3 years. Little further increase occurred in 1980 and 1981, with annual prevalences at 12.3% and 12.4%, respectively; and there were actually decreases in 1982 and 1983 (to 11.5% and 11.4%). Both annual and monthly prevalence rates are now slightly lower than they were in 1980, but lifetime prevalence is slightly higher (16.2% versus 15.7%).

Daily or near-daily use was less than 0.1% in 1975, and rose to 0.3% in 1980. This rate remained unchanged in 1981, and fell to 0.2% in 1982 and 1983.

USE AT EARLIER GRADE LEVELS

The initiation of cocaine use occurs at older age levels than most other illicit drugs. Of the 16% of the class of 1983 who have used cocaine, most users first tried it in the 10th, 11th, or 12th grade (13% of the total sample, or 81% of those who had used cocaine by the end of the 12th grade). Unlike most other drugs, there is less tendency for the rate of initiation to decline by 12th grade.

Initiation rates prior to 9th grade (that is, before or during the 8th grade) have remained low and stable, at less than 1% (although there was a slight increase from 0.6% for the class of 1982 to 0.8% for the class of 1983). There was some increase in initiation rates in 9th grade for the class of 1983 (which occurred in 1980). Thus, as figure 1 shows, there has been a slightly increasing proportion of seniors who report initiation prior to

10th grade. There had also been a gradually increasing proportion through the class of 1982 who report initiation in 10th grade. For example, 3.9% of the class of 1982 initiated use in 10th grade, compared to 2.4% of the class of 1978; this figure dropped back to 3.4% for the class of 1983. Initiation rates in the 11th and 12th grades have tended to parallel overall trends in prevalence: that is, they increased through 1980-81, and have been steady or slightly decreasing since then.

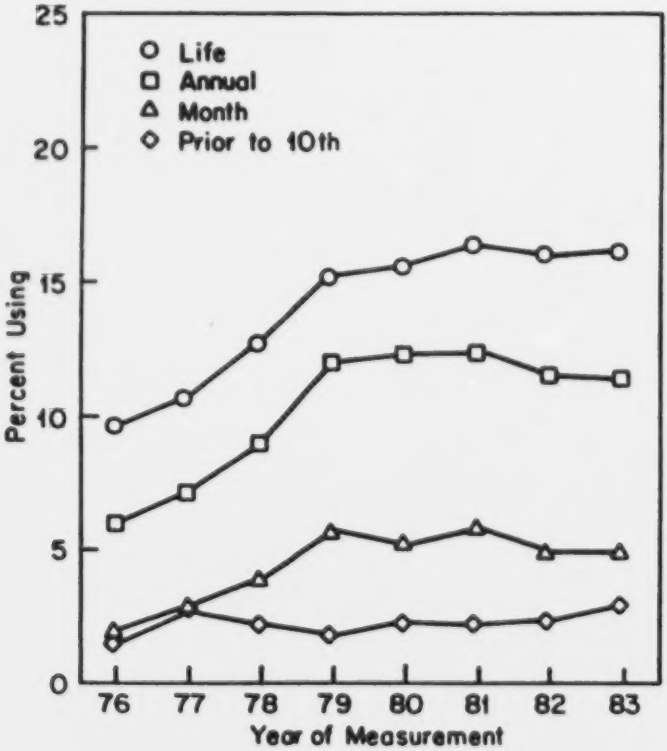

FIGURE 1

Trends in prevalence of cocaine use: Lifetime, annual, monthly, and use prior to 10th grade

FRIENDS' USE OF COCAINE

The relatively low use of cocaine by seniors is also indicated by seniors' reports of use by their friends. Considerably less than half (38%) say some of their friends take cocaine (see figure 2). The trend in figure 2 mirrors the data on prevalence, showing an increase between 1976 and 1980 and a recent very gradual decrease. The percent who say most or all of their friends take cocaine is currently at 5%, down slightly from the peak year of 1981 (6.3%).

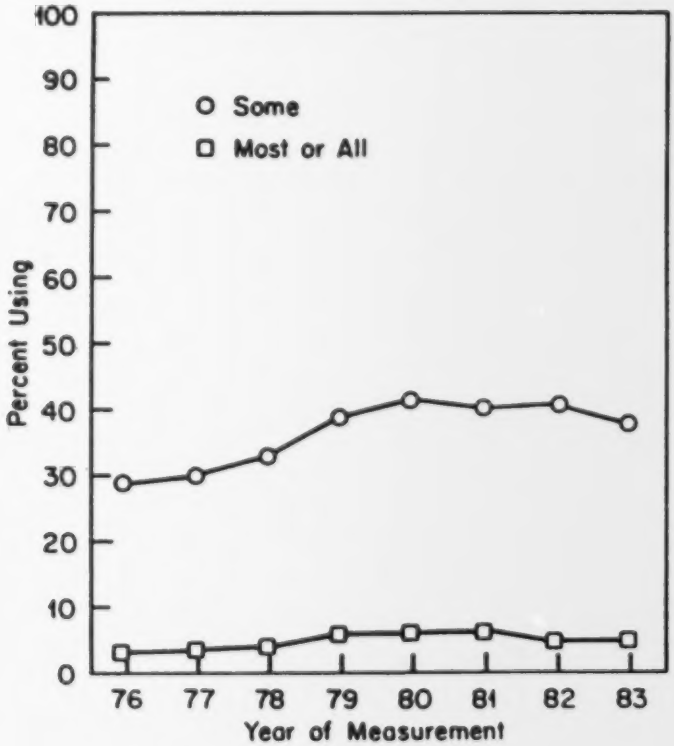

FIGURE 2

Trends in friends' use of cocaine: Percent saying some and most or all

EXPOSURE TO COCAINE USE

We asked seniors how often during the previous 12 months they were around people who were taking cocaine to get high or for "kicks," and the results are shown in figure 3. One-third (33%) of the class of 1983 had been exposed to such use at least once during the prior year, but more than half of these (19%) had been exposed only once or twice. Nine percent said they had been exposed "occasionally," and 5% said "often." (Note that 5% also said that most or all of their friends take cocaine.)

Trends in exposure to cocaine use closely follow the pattern of prevalence and use by friends.

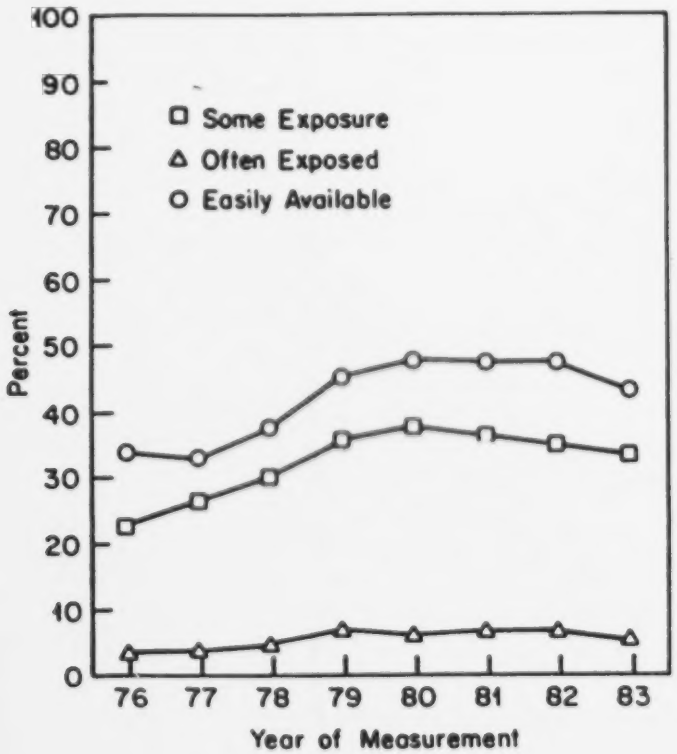

FIGURE 3

Trends in availability and exposure to use of cocaine: Percent reporting easy availability, some exposure, and frequent exposure

AVAILABILITY OF COCAINE

Less than half (43%) of 1983 seniors report that it would be fairly easy or very easy to get cocaine (figure 3). This statistic is down from 48% in the peak years of 1980-81, but is higher than the low point of 33% reported in 1977. Just about one-third (34%) of the seniors in the class of 1983 say that it would be very difficult or probably impossible for them to obtain cocaine. (The remaining 23% say that it would be fairly difficult for them to get cocaine.)

To summarize, it appears that some important and dramatic changes in both use and exposure to use of cocaine among high school seniors were occurring prior to 1980, but that there has been little change since then. It is possible that even in the absence of changes in behavior, there could be important changes occurring in attitudes toward cocaine. The next section deals with some questions that relate to attitudes and beliefs about cocaine.

PERCEIVED HARMFULNESS OF COCAINE USE

In spite of the dramatic changes in cocaine use since 1976 and the widely publicized dangers associated with it (John Belushi, Richard Pryor, and McKenzie Phillips are three names from the entertainment industry that come to mind), there has not been any dramatic change in perceived harmfulness. Instead, there has been a very gradual increase in the percentage of seniors who associate "great risk" of harm with regular use, from a low point of 68% in 1977 to 74% in 1983 (figure 4). On the other hand, using cocaine once or twice is seen as entailing great risk by fewer seniors in 1983 (33%) than in 1977 (36%).

With 74% associating great risk of harm, regular cocaine use is viewed as somewhat more risky than regular use of marijuana (63%), amphetamines (65%), or barbiturates (68%), but less risky than regular use of LSD (83%) or heroin (86%).

PERCEIVED DISAPPROVAL

Regular use of cocaine does not meet with approval among high school seniors; 93% of the class of 1983 say that they personally disapprove of such behavior (figure 5). This statistic has not changed much in recent years; even at its lowest point in 1979-81, it was at 91%. Trying cocaine once or twice is also disapproved by the great majority: 77% of 1983 seniors. And this figure has never been lower than 75% (in 1979 and 1981).

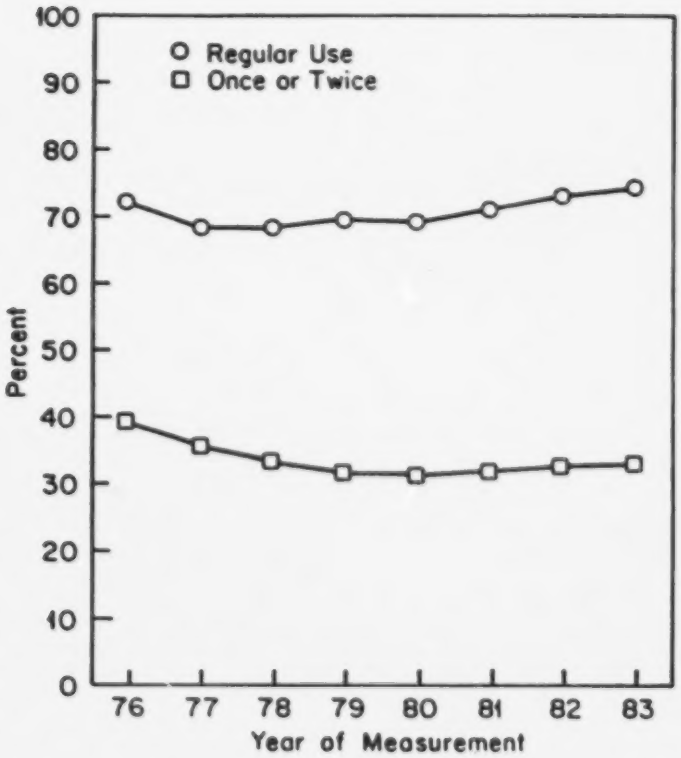

FIGURE 4

Trends in perceived harmfulness of cocaine use: Percent perceiving "great risk" of harm in use once or twice and in regular use

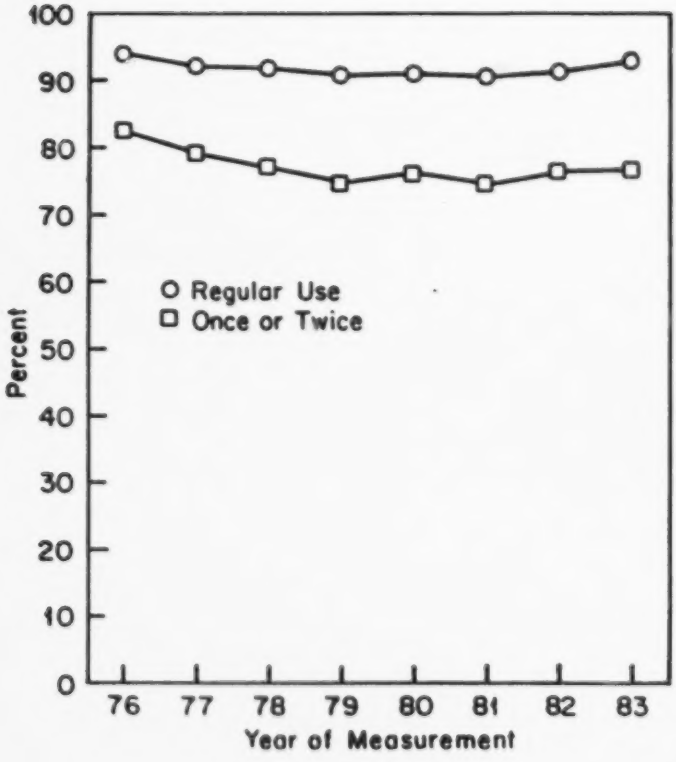

FIGURE 5

Trends in personal disapproval of cocaine use: Percent saying they personally disapprove of use once or twice and of regular use

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PROBABILITY OF FUTURE USE

The proportion of seniors indicating that they may use cocaine in the future increased somewhat between 1975 and 1979, and has been modestly decreasing since then. About 7% of 1983 seniors say they will "probably" or "definitely" be using cocaine 5 years in the future, whereas about 77% of the 1983 seniors say they "definitely will not" use cocaine 5 years in the future.

COMPARISONS FOR IMPORTANT SUBGROUPS

Table 1 provides trends in annual prevalence of cocaine use by important subgroups, classified by sex, college plans, region of the country, and population density.

Sex Differences

Cocaine use is greater among males than females; 18.6% of senior males have tried cocaine, compared to 13.4% of females. Similarly, annual prevalences are 13.2% and 9.3%, respectively. The ratio of male-female prevalence rates in cocaine use was rather large in the mid-1970s, but has diminished somewhat since then; nevertheless, there remains a sizeable difference in use.

College Plans

Prevalence rates are higher among noncollege-bound seniors--lifetime prevalence for 1983 noncollege-bound seniors was 18.3%, compared to 13.6% for college-bound seniors, and annual prevalences were 12.2% and 9.9%, respectively. Among the college-and noncollege-bound seniors, differences have remained small and roughly consistent in recent years.

Region of the Country

There are large regional variations in cocaine use, with the lowest rates in the South (7.7% annual prevalence) and the North Central (8.0%); the rate in the Northeast is almost twice as high (15.2%), and the West is still higher (19.2%). There has been a fair amount of regional fluctuation in cocaine use in recent years. Use in the North Central region has declined steadily since 1980. Use in the South was also declining but showed some increase this year. In the Northeast, annual prevalence increased through 1982 and fell off for the first time in 1983, while in the West, use declined in 1982 but increased in 1983.

TABLE 1

Cocaine: Trends in Annual Prevalence by Subgroups

	Percent Who Used in Last 12 Months									Change 1982
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1983
All seniors	5.6	6.0	7.2	9.0	12.0	12.3	12.4	11.5	11.4	-0.1
Sex:										
Male	7.5	7.5	9.3	11.4	14.6	14.8	13.8	13.1	13.2	+0.1
Female	3.9	4.4	4.9	6.5	9.3	9.8	10.4	9.6	9.3	-0.3
College Plans:										
None or under 4 yrs	NA	6.6	8.1	9.5	13.7	13.2	12.4	12.5	12.2	-0.3
Complete 4 yrs	NA	5.0	5.5	7.7	9.5	10.8	11.5	9.9	9.9	0.0
Region:										
Northeast	5.3	6.6	7.9	11.8	13.8	14.2	16.8	16.9	15.2	-1.7
North Central	5.1	5.5	6.3	8.5	10.5	10.9	9.4	9.0	8.0	-1.0
South	5.4	5.1	6.0	6.8	8.5	7.8	6.8	6.3	7.7	+1.4
West	7.8	7.9	10.2	10.7	18.6	20.6	22.1	17.9	19.2	+1.3
Population Density:										
Large SMSA	7.3	8.6	8.6	12.3	16.6	18.7	17.5	17.2	16.9	-0.3
Other SMSA	5.9	5.8	7.3	8.9	11.7	11.3	11.5	10.1	11.2	+1.1
Non-SMSA	4.3	4.3	5.8	6.4	8.9	8.9	9.4	8.5	7.3	-1.2

NOTES: See Johnston et al. (1984b) for definition of variables in table.
NA indicates data not available.

Population Density

There are also large differences associated with population density; cocaine prevalence is more than twice as high in the large metropolitan areas (16.9% annual prevalence), compared to the nonmetropolitan areas (7.3%). The smaller metropolitan areas are intermediate (11.2%). The differences in cocaine use associated with population density have been consistently evident; recently, annual prevalence appears to be declining at a faster rate in nonmetropolitan areas.

Initiation Differences

Subgroup differences in initiation largely parallel aggregate subgroup trends.

Thus, males, noncollege-bound students, students in the West and Northeast, and students in large metropolitan areas begin cocaine use at earlier ages; early initiation is particularly evident in the West.

THE YEARS AFTER HIGH SCHOOL

Trends in Use Following High School

Figure 6 shows the annual prevalence of use for the class of 1976, followed up annually from 1977 through 1983.[1] There is obviously a dramatic increase in cocaine use, from about 6% in 1976 to 26% in 1983, when the respondents averaged 25 years old.

One of the inherent problems in research which looks at changes related to age is that those changes are confounded with historical time. The changes observed in figure 6 could be maturational, that is, more people use cocaine as they get older, i.e., between the ages of 18 and 25; or, it could be that there is a general historical phenomenon wherein cocaine is becoming more popular among all ages during this time period. While this problem of separating age effects from secular trends is by no means easily solved, we can improve our understanding by looking at multiple cohorts, as illustrated in figure 7.

Unfortunately, the data are not altogether smooth. We might note here that this illustrates a distinction between the earlier seniors-only data on prevalence: those data were based on about 17,000 cases, while each followup prevalence point is based on about 1,000 cases. The difference in numbers means that there is about three or four times more sampling error in the followup data and in addition to that, there is also the normal problem of panel attrition; the result is that the followup data are less "well-behaved" than the senior year data. Also, it should be remembered that, as indicated in the section on research design, it is not the case that the same individuals are surveyed each year--instead, each individual is followed every other year; this results in more year-to-year variation than if each individual were surveyed every year.

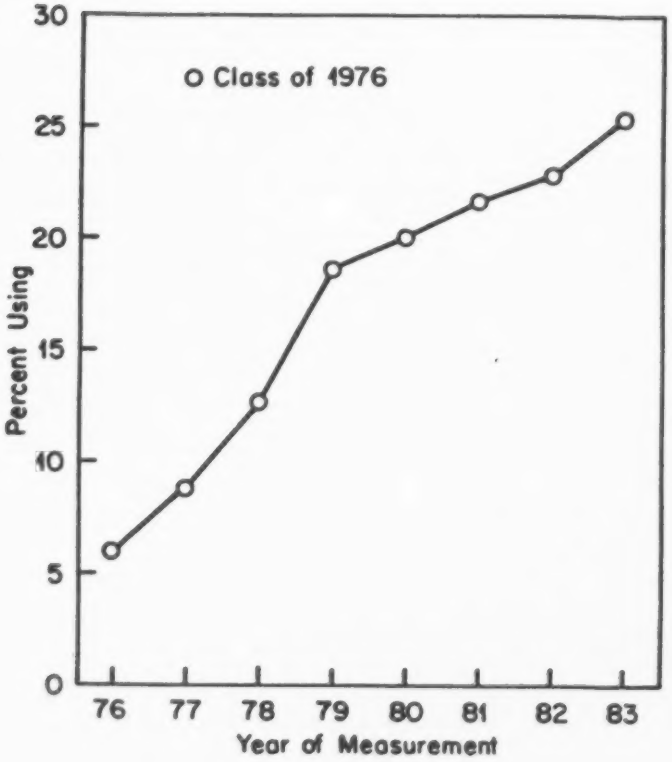

FIGURE 6

Annual cocaine prevalence, Class of 1976

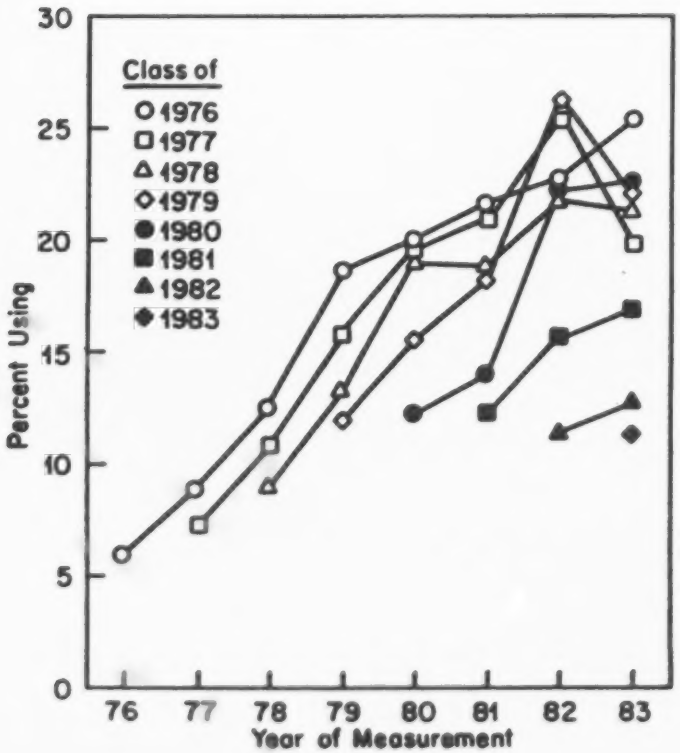

FIGURE 7

Annual cocaine prevalence, classes of 1976-83

From the data in figure 7, it appears that there is indeed some age effect: cocaine use increases after high school graduation. This is evident by an increase that always occurs between ages 18 and 19 even when there is no difference between successive 18-year-old cohorts. There also appears to be some secular trend occurring, at least through about 1980-81, because each age group shows increasing use. These points may be clearer if we look at the same data in another way: in figure 8 the lines connect same-age groups (instead of high school classes as in figure 7). The bottom line shows all 18-year-old respondents, the next line shows all 19-year-old respondents, and so on. The age effect is more clearly seen here; the prevalence rates for 19-year-old respondents is higher than that for 18-year-old groups, and the 20- and 21-year-old groups show still higher rates. Because of the much smaller number of cases available for the 22 and older age groups, the data are much less orderly; however, these older groups generally show rather high levels of cocaine use.

It is possible to use statistical models to try to explain the data parsimoniously in terms of various combinations of age, secular trend, or cohort effects. One such model that fits the data in figures 7 and 8 fairly well assumes that three effects are present: (1) a linear increase in use with age through age 21 (3.2% per year of age) with no further age-linked change, (2) a positive linear year effect (secular trend) through 1982 (1.3% per year), and (3) a separate effect for 1983 (a decline in use, -3.2%). This model generates a set of "predicted" points that fairly well approximate the observed data (O"Malley et al. 1984).

The major point to be made from these followup data is that cocaine does show an increase in the first few years post high school, and that there were particularly dramatic increases in the period between 1976 and 1981 or 1982. The combination of age-linked changes and secular trends produced disturbingly high prevalence of cocaine use among young Americans; approximately 20% to 25% of the 12- to 25-year-old cohorts used cocaine at least once in the prior year. The increase in the first few years after graduation is particularly striking because most other illicit drugs showed little change or decreases in use during the same time period. The data do not show convincing evidence of further age-linked changes after about age 21.

We turn now to another issue involving the use of followup data. The question to be addressed is: What implication does cocaine use at an earlier point have for use at a later point?

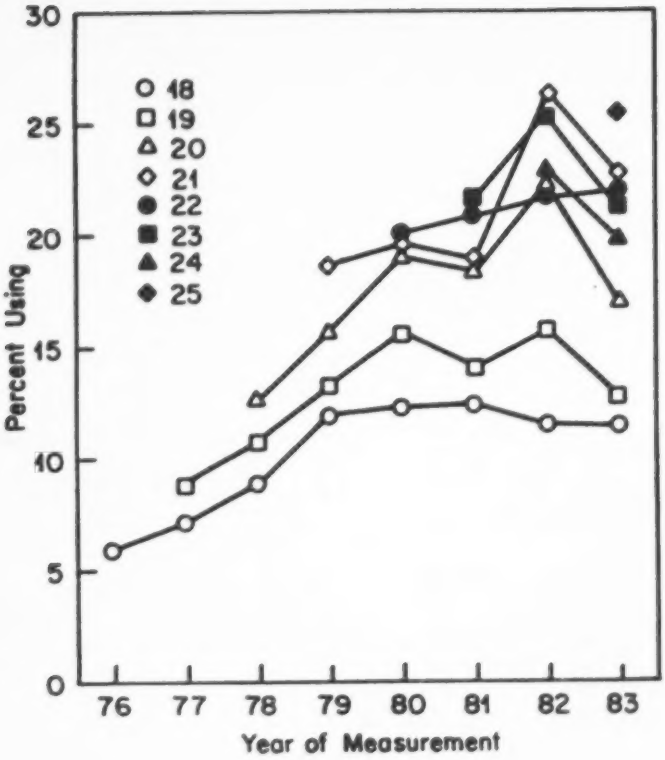

FIGURE 8

Annual cocaine prevalence, ages 18-25

Longitudinal Patterns of Use

There are many ways to approach this question, and we have chosen a simple and straightforward one for presentation here. We restrict analysis to those respondents who have provided data at three different time points and simply trichotomize the sample at each time point on the basis of cocaine use in the previous 12 months: no use, use on 1 to 9 occasions, and use on 10 or more occasions. One possible hypothesis, based on the fact that cocaine is a drug with extremely high dependence potential (Johanson 1984), is that there will be evidence of some progression in use. For example, individuals who report no use at the first time point, and 1 to 9 occasions of use at the second time

point, might be expected to show a high rate of transition into the 10 or more category at the third time.

Table 2 shows the pattern of use across time. The data in column one show senior year percentages collapsed across several classes; 92% used no cocaine, 7% used on 1 to 9 occasions, and 1.2% used on 10 or more occasions. Following the top group across two follow-ups, one can see that 84.12% did not use cocaine in the year prior to the first followup (which occurs 1 or 2 years post high school graduation), and 75.39% did not use cocaine in the year prior to the second followup (which occurs 2 years after the first follow-up, or 3 to 4 years after graduation). In order words, by the second followup, 75% of the total sample of respondents had reported no use in the year prior to each of the three surveys. (Another way of expressing the data is to say that of a hypothetical 10,000 individuals in the age group in the population, 7,539 used no cocaine at each of the three surveys.) Although the annual prevalence may be high (25% used cocaine at least once; see also the data in figure 7), table 2 indicates that very few 19- to 20-year-old Americans (2.8%) were using at high rates (10 or more times a year) in this interval, but that the number of 21- and 22-year-old users was more significant (4.7%).

One interesting group is those respondents who go from zero use in senior year to one to nine occasions of use in the first followup; 6.85% (or 685 of our hypothetical 10,000) of the sample exhibit this behavior. Two years later just about half of this group is still using at that level of one to nine occasions per year (3.46% of the total sample, or 51% of the 6.85%); about one-third have reverted to no use, and about one-sixth have increased use. Another interesting group is comprised of those who used cocaine on one to nine occasions during senior year of high school (6.63% of the sample). One or two years later, at the first followup, just about half of them were still using at that level, and more of the remainder had decreased than had increased (2.14% and 1.13%, respectively). And 2 years later, of those who were at the one to nine level in the first followup, about half were again using at that level (1.79% of 3.35%); about a quarter increased and a quarter decreased.

The main point to be gained from table 2 is that there is no clear evidence that there is an inevitable progression in cocaine use. Use on a few occasions does not seem to produce any necessary increase at a later period. Of course, this finding must be placed into proper context: the data are based on respondents to mail-in surveys, and the time lags are 1 or 2 years.

Post High School Role Statuses

Without presenting the data, we can briefly state that the use of cocaine changes as a function of marital status/living arrangements following high school graduation. In particular, those who married in the first few years after high school showed a decrease in use of marijuana and other drugs compared to other groups (Bachman et al. 1984); cocaine use followed a similar pattern.

TABLE 2

Longitudinal Patterns of Annual Use of Cocaine
Classes of 1976-1980

Base-Year Use	First Followup Use	Second Followup Use
92.18% (None)	84.12% (None)	75.39% (None)
		7.59% (<Ten)
		1.14% (Ten+)
	6.85% (<Ten)	2.33% (None)
		3.46% (<Ten)
		1.06% (Ten+)
	1.23% (Ten+)	0.20% (None)
		0.55% (<Ten)
		0.48% (Ten+)
6.63% (<Ten)	2.14% (None)	1.25% (None)
		0.71% (<Ten)
		0.18% (Ten+)
	3.35% (<Ten)	0.81% (None)
		1.79% (<Ten)
		0.75% (Ten+)
	1.13% (Ten+)	0.09% (None)
		0.38% (<Ten)
		0.67% (Ten+)
1.20% (Ten+)	0.28% (None)	0.20% (None)
		0.08% (<Ten)
		0.01% (Ten+)
	0.38% (<Ten)	0.05% (None)
		0.21% (<Ten)
		0.13% (Ten+)
	0.52% (Ten+)	0.03% (None)
		0.22% (<Ten)
		0.27% (Ten+)

Notes: Data are based on approximately 7,000 respondents who participated in two followups.

Entries sum up to 100% within each column.

CHARACTERISTICS OF COCAINE USERS

We now turn back to senior-year only results, and briefly report some data on the characteristics of cocaine users. Who are the users of cocaine? and, Why do they use cocaine? are some of the questions to be addressed in this section.

Predicting Use of Cocaine

Table 3 presents data on the association between cocaine use and various measures of background and lifestyle factors; these measures were selected as potentially important correlates of drug use in general, as well as of cocaine in particular. Bachman et al. (1981) provide more details on these measures and their associations with smoking, drinking, and drug use. Table 3 also provides results of multiple linear regression analyses in which all of the background and lifestyle factors are used to account for the variance in both cocaine use and, to provide some comparison, marijuana use. (Each dependent variable is an 11-category measure that combines information about lifetime, annual, and 30-day use.)

One important conclusion derived from table 3 is that there is a great deal of similarity in the variables that account for cocaine use and marijuana use. Regional variations aside, the most important (in terms of standardized regression coefficients) factors are identically rank ordered: truancy, evenings out for recreation, religious commitment, high school grades, and political views. Cocaine is generally thought to be a drug of particular appeal to people of high rather than low socioeconomic status (SES). To the extent that the level of parental education is an indicator of SES status, table 3 shows that status does have somewhat more of an association with cocaine use than with marijuana use, but that even in the case of cocaine, the association is weak. Another factor that might be expected to correlate well with cocaine use is amount of money available; but total income per week shows only a weak association with cocaine use, about the same as for marijuana.

Only 15.9% of the variance in cocaine use is accounted for by background and lifestyle factors; the corresponding figure for marijuana use is 26.7%. Marijuana use is more "predictable" largely because it is used more frequently than cocaine. (In general, rare behaviors will show lower percentages of variance explained than less rare behaviors.)

Cocaine Use and Use of Other Drugs

High school seniors who use cocaine tend to be consumers of other drugs as well. For example, of the seniors in the class of 1983 who are current cocaine users (that is, used at least once in the prior 30 days), 84% are current users of marijuana. By way of comparison, only 24% of the other seniors are current marijuana users. And more than a third (35%) of current cocaine users are

daily marijuana smokers, compared to only 4% of the rest of the sample. Alcohol and cigarettes use is also far more prevalent among current cocaine users. Four-fifths (80%) of them report having had five or more drinks in a row at least once in the prior 2 weeks (the corresponding figure is 39% for the other seniors), and half (50%) smoke cigarettes daily (compared to 19% among the others).

The picture that emerges from the preceding analyses is that cocaine does not seem to reflect a markedly different pattern of use than other illicit drugs. The same variables predict its use as marijuana, and its cross-time pattern does not reflect any indication that it is in some way unique.

MEASURES FROM RECENT USERS ONLY

Seniors who indicated that they had used cocaine at least once in the prior 12 months were asked a series of additional questions regarding how high they became and how long they stayed high, their reasons for use, situations of use, use with other drugs, difficulty in stopping use, and methods of use.

Degree and Duration of Highs

Cocaine is associated with fairly intense, but relatively short highs, according to seniors' reports. About one-quarter of the recent users say they usually get "a little" high, another quarter say "very" high, and most of the rest (37%) get "moderately" high. (The remaining 12% say they don't get high or don't take cocaine to get high.) Compared to other drugs, duration of the high is short: 41% stay high about 1 to 2 hours, 34% say 3 to 6 hours, and 10% even longer. The remaining 15% claim that they usually don't get high.

There are some strong changes in the degree and duration of highs associated with cocaine use: in both cases, there have been declines in recent years. For example, in 1976, 45% said they got moderately high and 40% got very high; the corresponding 1983 figures are 37% and 25%, which indicates that considerably fewer users were getting moderately or very high in 1983 compared to 1976. In 1976, only 28% had said they were high for only 1 to 2 hours, and 23% had claimed to stay high 7 or more hours; in 1983, the corresponding figures are 41% and 10%, reflecting briefer highs.

Reasons for Use of Cocaine

Recent users were asked to indicate the most important reasons for their use. Table 4 shows the percentage of users citing each reason; for comparison purposes, this table also includes the answers to similar questions asked of recent marijuana users. The major reasons cited for use of cocaine are to see what it's like (79%), to get high (70%), and to have a good time with friends (50%); these are also the major reasons cited for marijuana use.

TABLE 3

Background and Lifestyle Variables Related to Use of Cocaine and Marijuana: Correlations and Regression Results
Class of 1983

	Cocaine Use		Marijuana Use	
	r[1]	beta[2]	r[1]	beta[2]
Background Variables				
Sex (M=1, F=2)	-.068	-.019	-.110	-.031
Race (W=0, B=1)	-.039	-.029	-.033	-.024
Parents' Education	.048	.049	.007	.026
Number of Parents in Home	-.083	-.058	-.098	-.055
Urbanicity	.122	.061	.124	.069
Region				
Northeast	.069	.068	.083	.025
South	-.087	.008	-.089	-.036
West	.117	.093	.017	-.035
North Central	-.069	NA[3]	.000	NA[3]
Education Experiences and Behaviors				
Curriculum (College Prep)	-.083	-.023	-.130	-.022
College Plans	-.061	-.003	-.112	-.009
High School Grades	-.144	-.072	-.234	-.125
Truancy	.282	.175	.334	.204
Occupation Experiences and Behaviors				
Hours Worked per Week	.088	.010	.120	.026
Total Income per Week	.124	.044	.154	.040
Lifestyle Variables				
Religious Commitment	-.198	-.103	-.292	-.179
Political Views	.125	.072	.164	.089
Evenings Out for Recreation	.198	.105	.301	.182
Frequency of Dating	.141	.070	.184	.073
Percent of Variance Explained (Adjusted for degrees of freedom)		15.9%		26.7%

[1]The values in this column are product-moment correlations.
[2]The values in this column are standardized regression coefficients.
[3]Because dummy variable regression was used, one region had to be excluded from the regressions: the North Central was chosen because it was closest to average for the Nation as a whole.

The number of cases is approximately 15,500. Assuming a design effect of 3.7, an r (and beta) greater than .04 (absolute value) would be significant at p<.01.

TABLE 4

Reasons for Use of Cocaine and Marijuana
Class of 1983
(Entries are percent of recent users)

Reasons for Use	Cocaine	Marijuana
To experiment, see what it's like	79.3	64.6
To feel good, get high	70.8	72.8
To have a good time with my friends	49.8	64.5
To get more energy	29.7	NA
To relax, relieve tension	22.5	41.8
To stay awake	16.5	NA
To increase the effects of other drug	9.9	11.8
Because of boredom, nothing else to do	9.8	27.5
To seek insights and understanding	8.1	10.7
To fit in with a group I like	5.0	13.1
To get away from my problems or troubles	4.5	19.3
To get through the day	4.4	7.1
To decrease the effects of other drug	2.8	1.8
Because of anger or frustration	1.7	12.4
Because I am hooked	1.3	2.8

Note: The question asked is: What have been the most important reasons for your taking [drug]? (Mark all that apply.)

Other reasons are to relax or to relieve tension (23%), to get more energy (30%), and to stay awake (17%); all other reasons are cited by fewer than 10% of users.

Reasons for use have not changed much in recent years, except that there has been some increase in use to get more energy (up from 14% in 1976 to 30% in 1983) and to stay awake (up from 12% in 1976 to 17% in 1983).

Situations of Use

The situations in which high school seniors use cocaine are shown in table 5; again, corresponding data from marijuana users are included for comparison purposes. Only about 15% of seniors who used cocaine in the prior year used it when they were alone. A fair amount of use occurs in very small groups: 46% said they used most or every time with only one or two other people present. Use "at a party" most or every time was reported by 26%. (This compares to 31% for marijuana.) About one-quarter (23%) use with a date (or spouse) most or every time. (The figure for marijuana is 17%.) One-third (33%) had used with someone over age 30 present at least once.

About 4 of 10 (39%) high school seniors had used at home at least once, whereas only 1 in 10 (9.4%) had used at school. (This latter figure is 34% for marijuana.) About 4 of 10 used in a car, and about 1 of 8 (12%) used most or every time in a car.

The above situations show little consistent changes over time, with one exception. In 1976, one-third (33%) of users reported using at school, compared to about one-tenth (9.4%) in 1983. Users of marijuana, by contrast, still frequently used at school.

Cocaine Use in Combination With Other Drugs

Cocaine is often used in combination with alcohol or marijuana. Three-tenths (30%) of cocaine users say that they use it in combination with alcohol most or every time. But about the same proportion (32%) never used the two in combination. Similarly, 26% reported using it with marijuana most or every time, but 35% never used the two in combination. There is little use in combination with other drugs.

Trends in use of cocaine in combination with alcohol parallel trends in cocaine prevalence: increasing through 1980-81, and down slightly since then. Use in combination with marijuana has generally declined slightly.

TABLE 5

Situations of Use of Cocaine and Marijuana
High School Class of 1983
(Entries are percent of recent users)

Situation	Cocaine			Marijuana		
	Not at All	Few or Some-times	Most or Every Time	Not at All	Few or some-times	Most or Every Time
When you were alone	84.8	13.3	1.9	65.1	31.6	3.4
With just 1 or 2 others	12.7	41.1	46.2	7.6	49.6	42.8
At a party	42.8	33.5	23.7	25.9	43.4	30.6
When date or spouse was present	55.4	21.7	23.0	47.9	35.5	16.7
When people over age 30 were present	67.1	23.1	9.8	66.2	29.8	4.0
During the daytime (before 4 p.m.)	62.1	29.1	8.8	39.8	46.8	13.3
At your home (or apt. or dorm)	60.6	26.4	13.1	54.6	33.9	11.5
At school	90.6	8.1	1.3	66.3	26.8	6.9
In a car	61.5	26.3	12.2	20.6	50.8	28.6

Note: The question wording is: When you used [drug] during the last year, how often did you use it in each of the following situations?

Inability to Stop Using Cocaine

Recent users were asked if they had ever tried to stop using cocaine and found that they couldn't stop. Relatively few high school seniors respond affirmatively: 3.8% of the recent users in the class of 1983, and there has been very little change over time. (By way of comparison, almost 7% of marijuana users said they had tried to stop and found that they couldn't, and 18% of cigarette smokers.)

Mode of Administration

The great majority of senior users report sniffing or snorting cocaine (97% in 1983). Some also report smoking it (24% of users), and quite a few say "By mouth" (31%). Four percent of the users report having injected cocaine.

Over time, there has been some change in the percentage reporting use by mouth, rising from about 25% of users in 1976-78 to 40% in 1980-82, and dropping back to 31% in 1983.

SUMMARY AND CONCLUSIONS

In this chapter, we have tried to provide some objective information about the levels of and recent trends in cocaine use among America's adolescents and young adults, as well as some of their attitudes and beliefs about the drug and their reasons for using it. We have also examined cross-time patterns of use, certain predictors of use, and some of the conditions of the social and physical environments which are associated with use.

Overall, we have found levels of use to be relatively stable for the past several years after a period of rapid increase between 1976 and 1979. We also found a strong age effect, with cocaine use increasing in the first few years after high school. The levels of use, though stable recently, are disturbingly high, particularly among young adults in their early to mid twenties. Self reported use has followed patterns that parallel exposure to use and use by friend, as would be expected, assuming valid measures. Perceived availability also has moved in tandem with these other measures.

The great majority of today's seniors believe regular use to be dangerous, and 77% disapprove of even experimenting with cocaine. Use is found most frequently in the western and northeastern regions of the country, in more urban areas, among males, and among those who are not college-bound. Neither socioeconomic status nor personal income are very strongly associated with use; but a history of truancy, going out frequently in the evenings, and having relatively low religious involvement are.

Cocaine users tend to use other illicit drugs (particularly marijuana) and to be cigarette smokers and heavy drinkers much more frequently than nonusers. Thus, there is little evidence that

cocaine involves a separate drug-using syndrome. In fact, it is not uncommon for cocaine users to use marijuana or alcohol concurrently.

When taking cocaine, high school students most often snort it, though some (24% of recent users) smoke it while only 4% of the users inject it. It is almost always used with other people present, often at a party but more often with just one or two people present. Most use occurs in the evening, with very few young people using at school and a minority ever using at home or in a car.

Among the reasons most often cited for using cocaine use are: "to see what it's like," "to get high," and "to have a good time with my friends." Only about 1% of recent users say they use it because they are "hooked," and only about 4% say they have tried to quit and been unable to do so. In fact, most of those who used in high school do not show a cross-time progression to heavier use in the 3 to 4 years following graduation, which suggests that dependence either develops rather slowly or develops with relatively low frequency among moderate and light users.

FOOTNOTE

Estimation of Followup Prevalences: While the senior year data provide very good estimates of population values, the followup data are less accurate, due to the lower numbers of cases, random selection bias, and panel attrition. To estimate prevalence in the follow-up samples, participating followup respondents are weighted so that each followup panel has (when weighted) the same senior year prevalence as the total senior year sample for that class year. The followup prevalence rates are derived by applying these weights to the followup data; the adjustments provided by this procedure are generally small, as would be expected, given the high participation rates.

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Cocaine Use in Young Adulthood: Patterns of Use and Psychosocial Correlates

Denise B. Kandel, Debra Murphy, and Daniel Karus

INTRODUCTION

The use of cocaine increased sharply nationwide through the seventies, but appears to have stabilized in the last 2 or 3 years. The best documentation of this trend is provided by the repeated national surveys of high school seniors (Johnston et al. 1984) and of the general population (Miller et al. 1983). The trend is especially striking among young adults aged 18 to 25. The proportion reporting having ever experimented with cocaine increased from 9% in 1972, when the first in a series of national surveys of the general population was initiated, to 29% in 1982 (Miller et al. 1983). Similar trends have been reported for high school seniors, although rates of use have stabilized at lower levels (about 16%) for this younger age group. The popular interest and concern with abuse of cocaine is reflected in the mass media and is not limited to the United States (see Lentin 1984). Through vivid case histories of cocaine abusers, the media depict in detail the lifestyles of users and the mainly painful effects the drug has had on their lives. These cases are probably selected because of the sensational aspect of the users' experiences. It is difficult to ascertain from these reports how common these experiences are.

This chapter is an attempt to provide an overview of the use of cocaine in an unselected cohort of young adults and examines the lifestyles of young men and women who use the drug in such a general population sample. In particular, we address the following three questions:

1. What are patterns of cocaine use and the development patterns of involvement from adolescence to young adulthood in this population of young adults?

2. What are the lifestyles of the cocaine users and how do they compare to the lifestyles of other types of drug users and of young adults who have never used any illicit drugs?

3. Can we predict which adolescents will be most at risk for subsequent involvement in cocaine by early adulthood?

In order to provide a broader context for these issues, cocaine users are in many instances compared and contrasted to users of other illicit drugs.

THE DATA

The data derive from a followup of a cohort of young adults carried out in 1980-81. The cohort is representative of adolescents formerly enrolled in grades 10 and 11 in public secondary schools in New York State in 1971-72 (the high school classes of 1974 and 1973). The original high school sample was a random sample of the adolescent population attending public secondary schools in New York State in fall 1971, with students selected from a stratified sample of 18 high schools throughout the State. The target population for the adult followup was drawn from the enrollment list of half the homerooms from grades 10 and 11 and included students who were absent from school at the time of the initial study. The inclusion of these former absentees assures the representativeness of the sample and the inclusion of the most deviant youths. As we confirmed subsequently from data derived from school records, these absentees can be considered to be truants (Robins and Ratcliff 1980). In the school year 1971-72, the average number of school absences reported for the former regular students who had participated in the initial survey was 12 days as compared to 19.5 days for the former absentees.

With an 81% completion rate of those subjects still alive, 1,325 young adults were interviewed at a mean age of 24.7 years. Each personal interview took, on the average, 2 hours to administer and consisted almost exclusively of structured items with closed-end response alternatives. An unusual component of the schedule consisted of two charts designed to reconstruct on a monthly basis the respondents' life and drug histories (figure 1). In order to reduce the respondent's burden, the drug histories were ascertained only from persons who reported having used a given drug at least 10 times in their lives. Thus, measures could be obtained of the timing and number of events and of the continuity or discontinuity of participation in drugs and various social roles. Although the retrospective data have various limitations in that they are subject to various distortions, such as telescoping of recall,[1] they still provide unique information that is not otherwise available.

PATTERNS OF COCAINE USAGE AND RISK PERIODS

Patterns of Cocaine Use in Young Adulthood

It is useful to consider the epidemiology of cocaine use in young adulthood in the context of the use of other drugs by members of the cohort. The lifetime prevalence of legal and illegal drugs, and the use of various mood changing substances, with and without a prescription, are displayed in table 1.

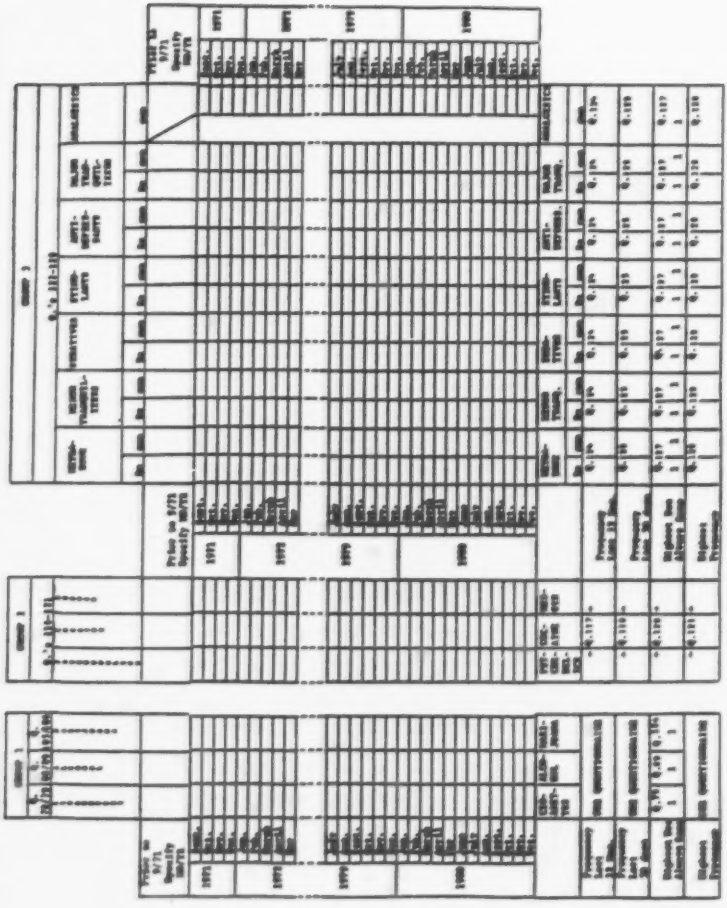

FIGURE 1

Drug History Chart

TABLE 1

Lifetime Prevalence of Legal, Illegal, and Medically Prescribed Psychoactive Drugs in New York State Young Adult Cohort at Age 24.7 (1980)

	Proportions Who Ever Used			
	By Followup			By Age 18
	Males	Females	Total	Total
Alcohol (beer, wine, or distilled spirits)	99	98	99	95
Cigarettes	80	79	79	68
Marijuana	77	68	72	54
Psychedelics	31	20	25	18
Cocaine	37	23	30	8
Heroin	5	1	3	1
Nonprescribed:				
Methadone	1.0	0.1	0.5	0.1
Minor Tranquilizers	18	15	17	7
Sedatives	23	15	19	10
Stimulants	28	18	23	10
Major Tranquilizers	3	0.4	2	0.7
Antidepressants	1	0.5	0.8	0.1
Prescribed:				
Methadone	2	0.3	1	0.5
Minor Tranquilizers	19	28	24	7
Sedatives	9	6	8	2
Stimulants	3	9	7	2
Major Tranquilizers	2	2	2	0.9
Antidepressants	1	3	2	0.8
Total N	(706)	(619)	(1,325)	(1,325)

Confirming epidemiological findings from other surveys, the prevalence of use of drugs in this cohort follows traditional patterns. The most frequently used drugs are the legal drugs: cigarettes and alcohol. Marijuana is the most prevalent illicit drug, having been used by 72% of the cohort. Cocaine is next in prevalence: 30% of the cohort have experimented with the drug, the proportion among men (37%) being 1 1/2 times as high as among women (23%). Among young men, this proportion is not only higher than that of those who have used illicit drugs other than marijuana, it is also higher than the proportion who have been prescribed mood changing drugs. Among young women, more report having been prescribed minor tranquilizers (28%) than report having used cocaine (23%).

These prevalence rates refer to the proportion of young adults who report having ever used each drug. However, cocaine use appears to be experimental in nature and to involve few experiences for a substantial portion of those who report any lifetime experience with the drug. One-half (53%) of the male users and two-thirds

(67%) of the female users have used cocaine less than 10 times in their lives; 34% and 28%, respectively, have used 10 to 99 times, 9% and 3% have used 100 to 999 times, and 3% and 2% have used 1,000 or more times. Not only do more men than women experiment with cocaine, but more men than women progress to heavier involvement with cocaine, as will be further documented shortly. This is a pattern that is common to many drugs, particularly in the early stages of their popularity and if their usage is considered to be especially deviant.

Of all the persons who reported any experience with cocaine, about two-thirds (68% among men and 61% among women) reported having used it in the last year preceding the survey. Such recency of use is related to overall extent of involvement. Those reporting use less than 10 times in their lives are less likely to be using within the last year (56% among men, 48% among women) than those who reported using cocaine at least 10 times in their lives (81% and 86%, respectively).

When cocaine is used, how frequently and regularly is it used? Respondents who reported having used cocaine at least 10 times in their lives were asked how frequently they had used it within the last year and in the period in their lives when they had used it most intensively. Modal frequency of use is "several times" a year (table 2) among both sexes; 44% of men and 55% of women use the drug less than once a month. Even in their period of highest use, very few users among those who used the drug at least 10 times in their lives used the drug every single day: only 5% among men and 4% among women; one-third used it once a week or more frequently.

Through the drug histories, we recorded periods of use and nonuse of each drug inquired about. A continuous period of use was defined as a spell. Male and female users report on the average 1.8 and 1.6 spells of cocaine use, respectively. The first spell of use covered approximately 3 years--39 months for male users and 33 months for females users. For those who had two spells, the interval between the first and second spells lasted over 1 year and was longer for women than for men by about 5 months (19 versus 14 months).

Periods of Risk for Initiation to Cocaine From Adolescence to Young Adulthood

In this cohort, men and women initiated the use of cocaine at 21 years of age on the average: 20.8 years among men and 21 years among women. It should be kept in mind, however, that these data are based on a cohort followed to age 25. If the risk for initiation did not terminate by that age, the average age of initiation would increase as a function of a longer followup interval in which the entire risk period would be covered.

TABLE 2

Frequency of Cocaine Use in the Last Year and in Period of Highest Use, Among Men and Women Who Used Cocaine at Least 10 Times in Their Lives

Pattern of Use	Males				Females			
	Last Year %		Period of Highest Use %		Last Year %		Period of Highest Use %	
Every day	2		5		-		4	
4-6 times a week	4	16	7	32	2	10	6	32
2-3 times a week	5		12		2		12	
Once a week	5		10		6		10	
2-3 times a month	22		17		15		21	
Once a month	17		17		19		13	
Several times a year	40	44	29	32	49	55	35	37
Once a year	4		3		6		2	
Total N	(82)		(100)		(47)		(52)	

Furthermore, the average age of initiation does not inform as to whether there exist specific periods of risk for initiation to cocaine from adolescence to early adulthood. Such periods of risk can be identified from the continuous observations obtained retrospectively on the use of drugs for the period of time elapsed between the initial and the followup interviews. Drug behavior can be examined as a dynamic process and hazard rates can be estimated.

The hazard rate estimates the incidence of drug use during a specified period, namely, the rate of occurrence of a particular event within a period among those estimated not to have undergone the event during the interval. One year was the time interval defined for the analyses. As applied to drug initiation, the hazard rate provides the proportion of individuals initiating use of a drug within a 12-month period among those estimated never to have used the drug during the interval. To provide a simplified illustration, if there are 100 adolescents who by age 21 have not used cocaine and 20 of them begin to use cocaine between the ages of 21 and 22, the hazard rate for the annual interval would be .20.

The existence of an age-specific risk factor makes the interval in which the factor operates different both from prior and from subsequent periods. A transition between periods characterized by a smooth progression, such as a systematic increase or decrease in the hazard rates, would be attributed to a gradual developmental maturational process. On the other hand, a substantial degree of discontinuity in the curve would be attributed to the existence of an age-specific risk factor. A maximum point in the function during the period under observation is interpreted as a developmental process in which risk increases and in which maturation occurs after a certain point in time.

Periods of risk over yearly intervals were examined through early adulthood. The pattern for cocaine is one of slowly increasing and continuing risk through the period of observation covered by the interview at age 24.7. This pattern in which risk does not terminate and continues to increase contrasts sharply with patterns observed for other drugs, legal and illegal.

Figure 2 displays hazard rates through age 25 for five drugs: alcohol, cigarettes, marijuana, psychedelics, and cocaine. The rates are displayed for the total cohort without differentiation by sex, since the trends are almost identical among men and women. It should be kept in mind that, because the data are based on a single cohort, maturation changes associated with age may be confounded to some extent with historical changes.

The rates for initiation into cigarettes, alcohol, marijuana, and psychedelics increase sharply through the teens. The rates begin to decline very rapidly at age 18, with slight differences among the drugs. In particular, the decline for cigarettes begins sooner than for the other substances. The pattern for cocaine is very different. Rather than declining, cocaine shows a steadily increasing rate of risk through age 24. The contrast between cocaine and marijuana is shown more clearly in an enlarged section of the graph that only displays these two drugs (figure 3). Cocaine is the only illicit drug which shows continuing increases in the risk of initiation through the period of the lifespan covered by the followup. This probably reflects historical trends in the popularity of the drug.

The contrast among the drugs is documented further by the age by which 90% of the users of each drug in this cohort were initiated into the drug (table 3). This occurs at age 20 for marijuana but at age 24 for cocaine. Given the fact that there is no censoring in marijuana initiation, we can conclude that the period of risk for initiation to marijuana terminates at least 4 years earlier on the average than for initiation to cocaine.

Data on additional cohorts would be required to determine the extent to which the cocaine pattern is truly maturational or reflects historical trends in the popularity of the drug.

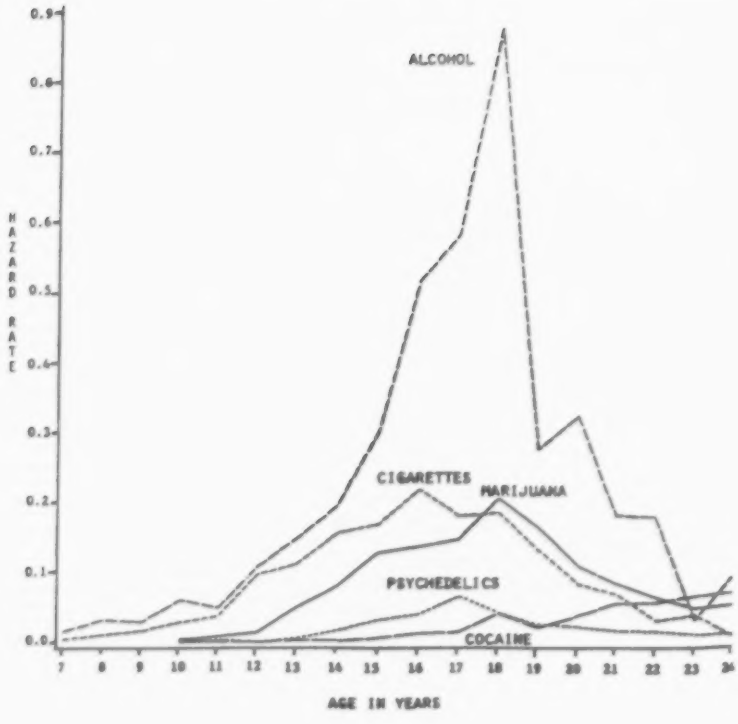

FIGURE 2

Hazard rates by age for alcohol, cigarettes, marijuana, psychedelics, and cocaine

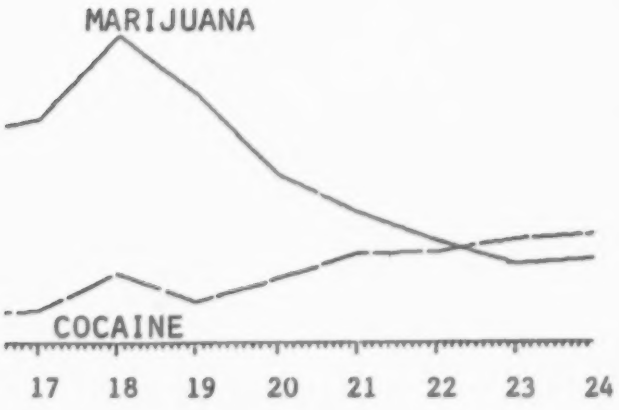

FIGURE 3

Hazard rates by age for cocaine and marijuana

TABLE 3

Age by Which 90% of Users of Each Drug
Have Been Initiated Into the Drug

Drug	Age	Total Users
Alcohol	18	(1,305)
Cigarettes	19	(1,049)
Marijuana	20	(955)
Psychedelics	21	(335)
Cocaine	24	(392)
Minor Tranquilizers - Own use	23	(216)
Sedatives - Own use	23	(245)
Minor Tranquilizers - Prescribed use	24	(311)
Sedatives - Prescribed use	23	(100)

LIFESTYLES OF COCAINE USERS

Having described patterns of cocaine use in this cohort of young adults, we consider a related question. Who are these young people who experiment with cocaine?

In order to answer this question, members of the cohort were classified into five drug-using groups that took into account not only their cocaine experiences, but also their experiences with other illicit drugs. Rather than simply contrasting cocaine users to noncocaine users, three contrast groups were defined: group 1, those who had never used any illicit drugs; group 2, those who had only used marijuana; and, group 3, those who had used other illicit drugs but not cocaine. In order to assess the effect of cocaine independently of the use of other illicit drugs, cocaine users were divided into those who had not used any other illicit drugs besides marijuana (group 4) and those who had (group 5). The last group includes 83% of all cocaine users among men and 80% among women. Because of the cumulative nature of drug involvement (Kandel 1975; Yamaguchi and Kandel 1984a), most of the persons included in the last three groups had also used marijuana.

The lifestyles and levels of functioning of these young adults were examined in six areas: use of other drugs; sociodemographic characteristics; participation in social roles of adulthood, including continuity of participation; health; degree of conventionality, as reflected in participation in conforming and delinquent activities; and drug use in their social networks. To simplify the presentation, documentary evidence is presented for males only. While the same trends generally characterize women, divergences that occur will be noted.

Striking differences emerge among the five groups regarding the use of other drugs and lifestyle variables. To anticipate our findings, young adults who have experimented with any kind of illicit drugs, including the exclusive use of marijuana, are quite different from those who have not used any illicit drugs. In most instances, the exclusive users of marijuana are ranked between those who have never used other illicit drugs and those who have used them. Those who have used other illicit drugs but not cocaine and those who have used cocaine but no other illicit drugs besides marijuana are similar to each other, except in their reported illicit drug use. Those who have used cocaine as well as other illicit drugs besides marijuana are the most deviant of all young adults, especially among men. The most striking differences appear in connection with lowered participation in social roles of adulthood, greater participation in deviant activities and especially in the use of other illicit drugs, and involvement in an intimate relationship with another cocaine user.

Use of Other Drugs

Users of any types of illicit drugs are much more likely to have used all other types of drugs than those who have never used any illicit drug (table 4a and 4b). While exclusive users of marijuana generally show the lowest degree of drug involvement, in every instance among men and in almost every instance among women, those who have used cocaine and other illicit drugs report higher lifetime involvement in other drugs than any other group of young adults. However, those who have not used cocaine and those who

have used cocaine exclusively do not show a consistently relative ranking across the use of various drugs. For certain drugs, young adults who have used cocaine exclusively are as likely or even more likely to have experimented with them than users of illicit drugs other than cocaine. For certain other drugs, the exclusive cocaine users report rates of use lower than not only those who have used cocaine and other illicit drugs but also lower than those who used other illicit drugs but not cocaine, as is observed for cigarettes, beer, and marijuana among women. By definition, the exclusive cocaine users report no experience at all with psychedelics, heroin, and nonprescribed minor tranquilizers, sedatives, and stimulants.

The users of cocaine and other illicit drugs are much more likely to have used any of the other types of illicit drugs than illicit drug users who have not used cocaine. For example, four times as many of the male users of cocaine and other illicit drugs (36%) report having used psychedelics at least 10 times in their lives as compared to users of other illicit drugs who have not used (9%) (table 4a and 4b); the corresponding percentages among women are 23% and 7%. Similarly, only among men and women who have used cocaine and other illicit drugs does one find individuals who report having used heroin at least 10 times in their lives.

Striking differences also appear among the groups with respect to the use of psychoactive substances that can be used under medical prescription. At noted above, by definition, young adults who have used no illicit drugs as well as those who have used marijuana or cocaine exclusively do not report any nonmedical use of tranquilizers, sedatives, or stimulants. But, by and large, they are also less likely to report prescribed use of these drugs. The highest rates of use of these drugs, both use on one's own and by prescription, is generally reported by young adults who have used cocaine and other illicit drugs. The differences between this group and those who have not used cocaine are especially striking with respect to nonprescribed use of stimulants. Of the cocaine users who also used other illicit drugs, 40% among males and 31% among females have used stimulants on their own more than 10 times. These proportions are more than twice as high as observed among individuals who have used other illicit drugs but have not used cocaine.

The differences between cocaine users who have not used other illicit drugs and those who have are attenuated with respect to the prescribed use of psychoactives. The same proportions in each group report to have used prescribed sedatives among men and prescribed minor tranquilizers and stimulants among women.

These data clearly document the greater involvement in all drugs of those individuals who use cocaine as well as other illicit drugs besides marijuana.

TABLE 4a

Lifetime Frequency of Use of Licit and Illicit Drugs
by Cocaine Usage in New York State Followup Cohort

	Males					Females				
			Used Marijuana					Used Marijuana		
Drugs Ever Used	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine Only %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine Only %	Used Cocaine and Other OID's[a] %
Cigarettes, 1000 or more times	22	45	54	52	65***	21	42	54	31	67***
Beer, 1000 or more times	30	52	49	52	62***	5	13	36	17	31***
Wine, 1000 or more times	7	13	18	26	23***	6	10	15	16	25***
Hard liquor, 1000 or more times	12	10	22	24	23**	2	13	19	14	19***
Marijuana, 1000 or more time	0	6	21	30	50***	0	4	13	6	32***
Psychedelics, 1000 or more time	0	0	9	0	36***	0	0	7	0	23***
Heroin, 1000 or more times	0	0	0	0	7***	0	0	0	0	1
Total N=	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at p<.05; **p<.01; ***p<.001.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

TABLE 4b

Lifetime Frequency of Use of Psychoactive Drugs That Can Be Medically Prescribed by Cocaine Usage in New York State Followup Cohort

Drugs Ever Used	Males					Females				
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine Only %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine Only %	Used Cocaine and Other OID's[a] %
Minor Tranquilizers:										
Rx, 10 or more	3	5	7	5	13**	5	8	9	13	14
Own, 10 or more	0	0	4	0	19***	0	0	10	0	16***
Sedatives:										
Rx, 10 or more	2	1	0	7	8***	1	0	4	4	7***
Own, 10 or more	0	0	6	0	27***	0	0	7	0	24***
Stimulants:										
Rx, 10 or more	0	1	0	0	5**	3	4	6	16	13***
Own, 10 or more	0	0	18	0	40***	0	0	15	0	31***
Antidepressants:										
Rx, 10 or more	1	0	0	0	2	1	1	2	0	3
Own, 10 or more	0	0	0	0	0	0	0	0	0	2*
Major Tranquilizers:										
Rx, 10 or more	1	0	4	0	2	0	1	2	0	3
Own, 10 or more	0	0	1	0	2	0	0	0	0	0
Analgesics:										
Rx, 10 or more	9	12	15	7	24***	11	14	24	30	33***
Own, 10 or more	5	0	3	1	10***	1	1	6	2	7**
Total N<	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at p<.05; **p<.01; ***p<.001.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

Age of Onset Into Drugs

Important differences among young adults also appear regarding the age of initiation into different drugs. Those who have used other illicit drugs in addition to cocaine started using cocaine 1 year earlier on the average than those who used cocaine exclusively, and have used the drug for a much longer period of time (table 5). Those who used cocaine exclusively, on the average, used cocaine for 18 fewer months than those who also used other illicit drugs, although the differences are not statistically significant.

Even greater differences among the groups appear with respect to their use of marijuana and other illicit drugs (table 5). Cocaine users who also used other illicit drugs started using marijuana at an earlier age than any other group. The differences are substantial, amounting to more than 2 1/2 years among men and women when compared with those who used marijuana exclusively, and 1 to 2 years when compared with cocaine users who did not use other illicit drugs or users of other illicit drugs besides marijuana who never used cocaine. Not only is marijuana use a precursor to the use of cocaine and other illicit drugs (Yamaguchi and Kandel 1984a, 1984b), but early marijuana onset is associated with the multiple use of cocaine and other illicit drugs.

Similarly, cocaine users who used illicit drugs other than marijuana are more likely to have started the use of such 4 years earlier than those who used cocaine but no other illicit drug besides marijuana (table 5).

Summary

Strong differences emerge, not only in the use of drugs but also in many lifestyle characteristics, between young adults who have experimented with illicit drugs, even if only marijuana, and those who have not used these drugs. On most attributes that were considered, those individuals who have used any illicit drug other than marijuana are much more deviant than those who have used marijuana exclusively. Among men, the differences are consistently strongest among those who have used cocaine and other illicit drugs. Among women, the differences are sometimes strongest among those who have used cocaine but no other illicit drugs other than marijuana.

Sociodemographic Characteristics

No systematic differences appear regarding sociodemographic characteristics, with the exception of race and the proportion on public assistance (table 6). The proportion on public assistance is two to four times higher among male users of cocaine and other illicit drug users than among any other category of young adults. Among women, there is an excess on welfare among those who use cocaine exclusively. As regards race, blacks are much less likely than nonblacks to report the use of other illicit drugs in the absence of cocaine. Although the differences are statistically

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TABLE 5

Ages of First and Last Use and Total Duration of Use Until Interview for Cocaine and Marijuana and Age of First Use of Illicit Drugs Other Than Marijuana by Cocaine Usage in New York State Followup Cohort

Lifetime Use Career	Males: Used Only Marijuana %	Males: Used Marijuana — Used One or More OID's But Not Cocaine[a] %	Males: Used Marijuana — Used Cocaine %	Males: Used Marijuana — Used Cocaine and Other OID's[a] %	Females: Used Only Marijuana %	Females: Used Marijuana — Used One or More OID's But Not Cocaine[a] %	Females: Used Marijuana — Used Cocaine %	Females: Used Marijuana — Used Cocaine and Other OID's[a] %
Cocaine:								
Total months used[b]	NA	NA	27.0	44.7	NA	NA	22.5	39.3
Age first used	NA	NA	21.7	20.8	NA	NA	21.8	21.0
Age last used	NA	NA	23.1	23.7	NA	NA	23.3	23.1
N (Used cocaine 10+ times/all)	(0/165)	(0/81)	(11/38)	(95/189)	(0/224)	(0/109)	(7/32)	(47/132)
Marijuana:								
Total months used[b]	60.1	70.8	71.9	99.5***	54.4	61.2	68.0	84.8***
Age first used	18.3	17.1	17.4	15.6***	18.5	17.0	18.1	15.9***
Age last used	22.4	23.4	24.2	24.5***	21.9	22.7	24.3	23.7***
N (Used marijuana 10+ times/all)	(95/165)	(75/81)	(11/38)	(95/189)	(121/224)	(76/109)	(31/32)	(126/132)
Illicit drugs other than marijuana:								
Age first used		19.4	21.7	17.9***		18.9	21.8	17.8***
N		(38)	(38)	(189)		(109)	(32)	(132)

***Differences among groups significant at $p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.
[b]Restricted to those who used cocaine or marijuana at least 10 times ever.

TABLE 6

Sociodemographic Characteristics by Cocaine Usage
in New York State Followup Cohort

Characteristic	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Black	9	7	0	11	8	19	12	6	26	7***
Father is high school graduate	73	75	70	67	72	61	67	74	64	78*
Does not have high school degree	4	8	11	7	10	7	7	9	2	5
Mean salary, if currently employed	16,641	15,985	14,843	15,119	15,633	11,012	11,452	10,780	12,583	11,393
Receives public assistant	3	4	4	5	11*	11	9	16	27	11*
Total N=	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at $p<.05$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

significant only among women, not a single black man is characterized by such a pattern of use. Black men and women are much more likely than nonblacks to report use of cocaine and one other illicit drug, except marijuana.

Participation in Roles of Adulthood

We examined participation in the two major roles of adulthood: work and family, as well as current student status. Consistent differences appear only in participation in the social roles of young adulthood revolving around the family (table 7). Cocaine users, whether or not they use other illicit drugs, are less likely to be married and more likely to be currently living with a partner or to have ever lived with a partner than any other group. The differences regarding a cohabitation experience increase among cocaine users who have also used other illicit drugs. Women who used cocaine exclusively are less likely to have had a child (table 7).

No systematic differences appear concerning current employment status among men and women or current student status among men. Among women, those who used cocaine but no other illicit drugs are much more likely to be currently in school (33% as compared to 14% among those who never used any illicit drugs). (See table 7.)

Another aspect of social functioning besides level of participation in social roles of adulthood pertains to the stability of participation. Lives can be characterized by different degrees of continuity in social participation. Individuals may move in and out of the labor force, or they may break up their relationships with spouse and partner. Differences among types of drug users on the dimensions of stability are greater than on participation itself. Cocaine users who have also used other illicit drugs are much more likely than any other groups to have life histories characterized by discontinuous rather than continuous patterns of participation in all social roles of adulthood, employment as well as close interpersonal relationships expressed in marriage or cohabitation, but not schooling (table 8). While continuous patterns are also more frequent among young adults who used marijuana exclusively and those who also used one or more other illicit drugs but not cocaine, they are accentuated among the cocaine users who also used other illicit drugs. This group experiences increased movement in and out of the labor force, as well as increased periods of unemployment. A higher proportion of users of cocaine and other illicit drugs have experienced four or more job changes in their lifetime, and a higher number of spells of unemployment. Among men, separation or divorce is highest in this group and among those who have used other illicit drugs without cocaine, while among women, separation and/or divorce is highest among those who used cocaine exclusively (table 8). Termination of unmarried cohabitations among men and women, as well as the experience of abortions among women, are highest among the cocaine users who also used with other illicit drugs. Thus, women who used cocaine and other illicit drugs are more than five

TABLE 7

Current Role Participation by Cocaine Usage
in New York State Followup Cohort

Current Role Participation	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Currently employed	79	88	90	82	87	62	69	70	83	73
Currently student	16	11	22	16	13	14	14	7	33	11**
Married, living with spouse	50	42	32	24	24***	56	50	46	22	27***
Currently living with partner	2	10	7	8	17***	6	7	10	15	16*
Ever lived with partner	13	25	27	34	45***	11	24	35	34	50***
Ever Married and a parent	50	47	53	45	46	72	56	46	31	46***
Ever Married N	(69)	(76)	(36)	(11)	(58)	(128)	(133)	(56)	(8)	(48)
Total N	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at $p<.05$; **$p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

times as likely to have had at least one abortion than women who never used any illicit drugs, but only four times as likely if they only used cocaine (table 8).

Conventionality

Users of illicit drugs are generally more likely than nonusers to be involved in lifestyles that reflect lesser attachment to conventional institutions and greater participation in delinquent activities, although on certain criteria there are no differences among the three subgroups of users of illicit drugs other than marijuana.

This is especially the case as regards political attitudes, attendance at religious services, and moving traffic violations (table 9). However, young adults who have used cocaine and other illicit drugs are more likely than any other group to report being involved in auto accidents while drunk or stoned (men only), and having ever been arrested by the police, except for a traffic violation (men and women) (table 9). These young men and women also score highest on an index of lifetime delinquent involvement. The males are not any more likely than users of other illicit drugs to have ever been convicted of a crime.

Health

Somewhat different patterns of association between cocaine and health-related criteria appear among men and women.

Among men, there are no significant differences among groups of young adults concerning self-related health, reports of disability due to health problems, and medical hospitalizations during the last 12 months (table 10). Women who used cocaine exclusively, however, are least likely to rate their health as excellent.

The most important relationships among men and women pertain to mental health variables. While men and women who use any type of illicit drugs report feeling less happy about life than young adults who have not used any illicit drugs, the least happy among men are the users of illicit drugs without cocaine experience, but the least happy among women are the cocaine users who have used no other illicit drug besides marijuana. Among men, two groups show much increased rates of having ever consulted a mental health professional and of psychiatric hospitalizations: those who used illicit drugs other than marijuana, with or without cocaine (20% for consultations, and 3% and 5%, respectively, for psychiatric hospitalizations). Men who used cocaine exclusively have low rates on these two variables, equivalent to those who have never used illicit drugs or those who used marijuana exclusively. Among women, however, consultation with a mental health professional increases dramatically with exclusive use of marijuana and is as high among the exclusive cocaine users as among those who used illicit drugs other than cocaine; the rate is highest among those who used cocaine and other illicit drugs. Psychiatric hospitalizations among women are reported only among cocaine users, whether

TABLE 8

Continuity of Role Participation by Cocaine Usage
in New York State Followup Cohort

Continuity of Role Participation	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Left school full-time before age 18	8	4	13	3	7	9	9	15	15	14
Four or more jobs	34	40	40	42	57***	21	34	35	27	54***
Number of unemployment spells	0.7	0.7	0.7	0.7	1.2***	.6	.7	1.0	.6	1.1***
At least one separation/divorce	5	12	23	12	23***	14	17	19	47	33*
At least one terminated unmarried cohabitation	5	11	14	23	28***	1	9	18	15	27***
At least one abortion	NA	NA	NA	NA	NA	5	9	17	21	25***
Total N≤	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at $p<.05$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

TABLE 9

Attachment to Social Institutions, Accidents, and Delinquency by Cocaine Usage in New York State Followup Cohort

Attitudes/Deviance, Accidents, and Delinquency	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Political attitudes: liberal, radical	20	23	43	47	47***	23	27	33	43	45***
Attended religious services at least once in last 12 months	65	56	48	46	43***	72	57	51	49	35***
In past year, at least once:										
Moving traffic violation	30	23	31	31	34	10	14	10	21	15
Auto accident	14	17	18	12	19	5	9	4	8	9
Auto accident while drunk	0	4	1	3	6*	0	1	0	0	0
Auto accident while stoned	0	0	0	0	5***	0	0	0	0	0
Ever arrested by police, except for traffic violation	8	17	26	27	49***	3	4	7	6	9
Ever convicted of a crime	3	5	14	13	13**	1	2	1	0	5
Mean score on lifetime delinquency scale	.2	.5	.5	.6	.7***	.1	.1	.1	.1	.2*
Total N ≤	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at $p<.05$; **$p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

TABLE 10

Health Status by Cocaine Usage In New York State Followup Cohort

Health Status	Males					Females				
		Used Marijuana					Used Marijuana			
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Excellent health for age (self-rated)	41	53	55	42	42	35	41	28	16	40*
Work limiting health problem	6	6	2	5	9	7	8	8	10	9
Any medical hospitalization[b] in last 12 months	7	5	6	3	7	12	11	12	13	10
Ever seen mental health professional	6	8	20	3	20***	5	15	20	20	26***
Mental health hospitalization (ever)	1	0	5	0	3*	0	1	0	4	4***
SCL-90 Depression score	1.5	1.6	1.8	1.6	1.7***	1.6	1.8	1.9	1.9	1.8**
Felt very happy about life as a whole	44	34	19	24	29*	50	37	28	19	30***
Total N≤	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(32)	(132)

*Differences among groups significant at $p<.05$; **$p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.
[b]Excluding hospitalizations related to pregnancies for women.

or not they have also used other illicit drugs (4% lifetime in each group).

Social Context of Use

One of the strongest relationships is that of cocaine use with increased use of various illicit drugs by spouse or partner and friends (table 11). (Unfortunately, a question about friends' cocaine use was not asked in the interview.) The proportion of friends reported to have used marijuana or other illicit drugs increases dramatically among the five groups being compared, as does the proportion of marijuana-using spouses or partners.

However, use of cocaine or illicit drugs other than marijuana by the spouse or partner is reported only among young adult males who are also involved in other illicit drugs in addition to cocaine. Almost a quarter of such men report that their spouse or partner use cocaine. Among women who use cocaine, their partners or spouses are also much more likely to be using cocaine whether or not these women also use other illicit drugs, although the proportion of spouses or partners who use cocaine is highest among women who use other illicit drugs.

In young adulthood, as in adolescence, drug users are embedded in a social network of friends and intimates who are themselves consumers of illicit drugs and sustain the focal respondent's drug use. The congruence in cocaine use among young adults and their spouses or partners is stronger among women than among men.

Can One Account for Differences in Lifestyles Among Drug-Using Groups?

Young adults who have experimented with cocaine as well as other illicit drugs are clearly the most deviant of all young adults, with some exceptions among women. These young adults are more deviant than those who used cocaine exclusively or who have used other illicit drugs without using cocaine. What accounts for these differences? The answer, we believe, lies in the overall pattern of drug involvement of these various subgroups. Those who use cocaine and other illicit drugs are much more heavily involved than other individuals not only in cocaine but in a variety of drugs. This latter relationship persists even when one controls for their degree of cocaine involvement.

Respondents were asked how many times in their lives they had used each drug or class of drugs. We noted earlier that the majority of cocaine users have used cocaine fewer than 10 times altogether. Those who have used other illicit drugs in addition to cocaine are much more likely to report using cocaine more than 10 times than those who have only used cocaine, 50% versus 29% among men, for example. The respective extent of cocaine involvement by those who have used cocaine exclusively and those who have not may account in part for the differences in lifestyles characterizing

TABLE 11

Social Context of Cocaine Usage in New York State Followup Cohort

Social Context of Cocaine Use	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Spouse/partner has used while living together:										
Marijuana	1	18	44	41	57***	10	33	46	74	66
Psychedelics	0	0	3	0	8**	0	1	3	0	7
Stimulants	0	4	3	0	9	1	1	9	0	12
Cocaine	0	1	0	0	23***	1	1	5	20	30
Heroin	0	0	0	0	2	0	0	0	0	1
Total N ≤	(72)	(89)	(40)	(12)	(90)	(141)	(145)	(66)	(13)	(64)

*Differences among groups significant at $p<.05$; **$p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

TABLE 11 (Continued)

Social Context of Cocaine Usage in New York State Followup Cohort

Social Context of Cocaine Use	Males					Females				
			Used Marijuana					Used Marijuana		
	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %	Never Used Any Illicit Drugs %	Used Only Marijuana %	Used One or More OID's But Not Cocaine[a] %	Used Cocaine %	Used Cocaine and Other OID's[a] %
Friends currently use:										
Marijuana: Most all friends	8	19	39	58	66***	5	23	34	42	59***
Pills: At least one friend	26	40	66	59	80***	12	31	45	64	75***
Heroin: At least one friend	3	2	3	9	9*	1	3	1	0	4
Total N=	(134)	(167)	(88)	(38)	(189)	(208)	(224)	(109)	(31)	(132)

*Differences among groups significant at $p<.05$; **$p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

the two groups. An additional and crucial factor, however, is the increased involvement of the last group in other illicit drugs, especially marijuana, psychedelics, and heroin.

The two groups of cocaine users were divided according to whether they had used cocaine fewer than 10 or more times. Because of the relationship between use of other illicit drugs and extent of cocaine involvement, certain resulting cells are extremely small among cocaine users who have used other illicit drugs but have used cocaine fewer than 10 times. There are only 11 such cases among men and 7 among women. Table 12 displays selected drug use of five groups of users: those who have used other illicit drugs but not cocaine, and the two cocaine groups divided according to whether each had used cocaine fewer than 10 times in their lives or at least 10 times.

The differences are striking. Among men who used illicit drugs other than marijuana, including using cocaine at least 10 times, the proportion reporting at least a thousand lifetime experiences with marijuana (73%) is more than 3 1/2 times higher than among those who never used cocaine (21%), or 2 1/2 times higher than among those who used cocaine fewer than 10 times (28%). Similarly, although the very small sample size must lead to caution in interpretation, those who have used cocaine exclusively, but more than 10 times, report much higher lifetime experience with marijuana than those who used cocaine fewer than 10 times. Similar trends appear among women. Heroin users are found only among those men and women who used cocaine more than 10 times and also used other illicit drugs. Substantial differences are also found in the nonprescribed use of minor tranquilizers, sedatives, and stimulants. The differences are somewhat attenuated regarding prescribed use of these drugs among men; and prescribed use is in fact higher among the seven women who used cocaine exclusively, but more than 10 times, than among those who also used other illicit drugs. But these differences may be unstable because of the extremely reduced size of the sample.

While the issue needs to be further investigated, these preliminary results suggest that the heavier involvement in a variety of drugs by individuals who use cocaine and other illicit drugs may partly account for their less favorable outcomes and lifestyles.

ADOLESCENT PREDICTORS OF COCAINE USE

Finally, let us turn to the third theme. Can one predict in adolescence which youths are especially at risk for cocaine involvement by the time they reach young adulthood?

TABLE 12

Use of Illicit and Medically Prescribed Drugs by Various Groups of Cocaine Users in New York State Followup Cohort

	Males					Females				
		Cocaine Only		Cocaine and Other Illicit[a]			Cocaine Only		Cocaine and Other Illicit[a]	
	Used Illicit No Cocaine %	Fewer Than 10 Times %	More Than 10 Times %	Fewer Than 10 Times %	More Than 10 Times %	Used Illicit No Cocaine %	Fewer Than 10 Times %	More Than 10 Times %	Fewer Than 10 Times %	More Than 10 Times %
Marijuana, 1000+ times	21	17	62	28	73***	13	8	0	24	46***
Psychedelics, 10+ times	9	0	0	21	50***	7	0	0	16	36***
Heroin, 10+ times	0	0	0	1	13***	0	0	0	0	3
Prescribed: Minor tranquilizers, 10+ times	7	7	0	8	17**	9	6	36	13	15
Total N	(88)	(27)	(11)	(94)	(95)	(109)	(25)	(7)	(85)	(47)

**Differences among groups significant at $p<.01$; ***$p<.001$.
[a]Includes psychedelics, heroin, and nonprescribed use of methadone, stimulants, sedatives, minor and major tranquilizers, and antidepressants.

In order to answer this question, we capitalized on the longitudinal design of the research and examined cocaine experience in young adulthood as a function of what was known earlier about these individuals during their adolescent years. Regression analyses were carried out with selected characteristics measured in adolescence entered in the equations as predictors of lifetime cocaine experience. The dependent variable was whether the respondent had ever used cocaine. The analyses were restricted to those who had not initiated cocaine by the time of the initial survey--the overwhelming majority of the users. Indeed, of the 391 young adults who ever used cocaine, only 6.3% had done so by the time of the initial survey at age 15 to 16.

The variables included in the analyses measured sociodemographic factors as well as factors from three important domains of variables: family factors, peer factors, and adolescent individual attributes (table 13). These variables were selected because they capture important aspects of adolescent life, in particular components of the socialization process, such as role modeling, social reinforcement, and quality of the parent-adolescent relationship, as well as degree of commitment to school and other social institutions. These factors were found in earlier analyses carried out when the subjects were adolescents to predict initiation into various stages of drug use over a short-term interval (Kandel et al. 1978; Kandel and Andrews 1984).

Although these variables as a group account for 22% of the explained variance in cocaine initiation among men and 16% among women, very few specific variables have a statistically significant predictive effect when all other factors are entered in the equations. Because of strong multicollinearity among the drug-related variables, especially those indexing self-use and friends' use, a reduced set of variables was retained in a final model in order to obtain more stable estimates of the effects of specific variables. Variables retained in the final model are indicated with an asterisk. The reduced set accounts for a slightly lower proportion of the variance, 20% among men and 13% among women. Zero-order correlation coefficients and standardized regression coefficients between the significant predictors and cocaine initiation are presented for men and women separately (table 14).

Controlling for other factors, very few variables show significant regression effects. One factor shows significant and consistent effects on cocaine initiation both among men and women, namely frequency of marijuana use in adolescence by the time of the initial survey 9 years earlier, when respondents were 15 to 16 years old. This is the only significant predictor among men. Among women, an additional factor, father's educational level, is significant. The higher the education of the father, the greater the likelihood of initiating cocaine subsequently. Other factors, which show significant zero-order correlations with cocaine initiation, have no significant effect once all other factors, especially frequency of marijuana involvement, are simultaneously

TABLE 13

Adolescent Predictors Entered Into Equation

Background Characteristics

*Race
*Religion
*Father's education

Parental Factors

*Father hard liquor use
*Mother frequency psychoactive drug use
*Parent tolerant of marijuana use

Peer Factors

Number of friends perceived to be using marijuana
Number of friends perceived to be using other illicit drugs
Friends' approval of drug use
*Degree of peer orientation
*Degree of peer activity
Number of people who could sell marijuana

Individual Characteristics

*Number classes cut
*Participation in political demonstrations
*Church attendance
*Participation in minor delinquency
Participation in major delinquency
*Depressive symptoms
*Conformity to adult expectations
Believes regular marijuana use harmful
Agrees marijuana should be legalized
*Extent of cigarette use
*Extent of use of hard liquor
*Extent of marijuana use
*Ever used illicit drug other than marijuana or cocaine

---

*Retained in final model.

controlled. The factors that show a significant zero-order correlation reflect increased peer orientation and less conventionality in adolescence. The peer-related factors include the degree to which adolescents were oriented to their peers rather than to their parents, and the extent of their interactions with friends. The factors related to nonconformity include cutting classes; participation in delinquent activities and in political demonstrations; decreased church attendance; and use of legal and illegal drugs besides marijuana. For men, the other drugs whose use in adolescence is significantly correlated with subsequent cocaine initiation include alcohol, other illicit drugs, and cigarettes, in that order. For women, the highest correlations next to marijuana include adolescent use of cigarettes, with alcohol and other illicit drugs being tied for third place. Among men and women, Jews have an increased risk of involvement in cocaine and Protestants a reduced risk. Race shows no significant association.

TABLE 14

Standardized Regression and Correlation Coefficients for Significant Adolescent Predictors of Cocaine Initiation by Age 24-25

	Males		Females	
Adolescent Predictor	r	β	r	β
Lifetime frequency marijuana use by T1	.361***	.249***	.293***	.242***
Father educational level	.062	.050	.138**	.131**
R^2	.20		.13	

**p<.01; ***p<.001.

In an attempt to capture the potential effects of variables within a particular conceptual domain, analyses were carried out in which the total and unique variances contributed to cocaine initiation by each domain were assessed. The total variance accounted for by each domain was ascertained by entering the relevant variables as exclusive predictors in the equation. Unique variances were ascertained from the additional variance contributed in turn by each particular domain, once the other four had been entered in the equations. While each domain, except parental variables, has a significant total variance, only a single domain, that of adolescent drug use, makes a unique significant contribution to the explained variance (see table 15). Among men and women, drug use in adolescence accounts for more total variance by far than any other domain--twice as much as the next important domain among

men, and three times as much among women. Among men, individual attributes and involvement with peers are next in importance to adolescent drug use; among women, the two domains as well as sociodemographic background factors share equal importance.

TABLE 15

Total and Unique Variances Contributed by Five Domains of Adolescent Variables to Subsequent Cocaine Initiation by Early Adulthood

	Males		Females	
Domains of Variables	Total Variance	Unique Variance	Total Variance	Unique Variance
Sociodemographic	.03*	.02	.03**	.02
Parental	.01	.00	.01	.00
Peer	.06***	.00	.04***	.00
Individual Characteristics	.08***	.01	.03*	.01
Drug Use and Attitudes	.16***	.07***	.10***	.04***
Total	.20		.13	

*Significant at $p<.05$; **$p<.01$; ***$p<.001$.

The preeminence of drug use in adolescence as a predictor of subsequent initiation to cocaine is consistently substantiated by these results.

CONCLUSION

In conclusion, we would like to emphasize the major inferences we draw from this examination of cocaine use in a general population cohort. Although experience with cocaine is widespread among adults by the time they reach their midtwenties--involving more than one-third of the men and one-fifth of the women--for most individuals this experience is very limited, amounting to fewer than 10 trials of the drug. Those who use cocaine more than on an experimental basis and have also experimented with illicit drugs other than marijuana display the most deviant lifestyles of all young adults, more deviant than of those who have only experimented with marijuana or with other illicit drugs but not with cocaine. Users of cocaine and other illicit drugs are most likely to be unmarried, to have had unstable work and marital histories, to have been involved in car accidents while drunk or stoned, to have been arrested by the police, and to have suffered psychiatric

problems. The behavior of these individuals seems to be sustained by a receptive interpersonal environment, since by their own accounts they are married to spouses or living with partners who themselves use cocaine, marijuana, and other illicit drugs and move in social circles where the use of illicit drugs is extensive. In part, these divergent lifestyles can be accounted for by the more extensive involvement of the users of cocaine and other illicit drugs than those of other young adults in legal and illicit substances.

The attempt to identify early risk factors that would predict subsequent cocaine involvement implicates marijuana use as the major factor. Frequency of marijuana use in adolescence, both for men and women, is the most significant predictor of subsequent cocaine initiation, and in the case of men the only significant predictor. Parallel analyses using different analytical techniques based on life event histories (Yamaguchi and Kandel 1984a, 1984b) have similarly identified marijuana as a crucial link in the progression from legal drugs to the use of all types of other illicit drugs. Controlling for other variables, marijuana use consistently emerges as a crucial predictor of subsequent involvement in other illicit drugs.

Many questions are left unresolved. In particular, what accounts for the link between the use of marijuana and of other illicit drugs? Would the link disappear were experience with marijuana precluded? There certainly is a self-selection factor involved. Young people who experiment with marijuana are different initially from their peers who do not experiment. But self-selection is not a sufficient explanation, since the link persists even when initial differences are controlled for. Do individuals get involved in social networks of users which further sustain these drug-using patterns? Are there pharmacological effects of the drug itself that could account for the link? One point is clear, however: early onset into marijuana greatly increases vulnerability to subsequent progression to other illicit drugs. To recall one of the findings we noted above, young women and men who subsequently experimented with other illicit drugs in addition to cocaine had initiated the use of marijuana 2 to 3 years earlier on the average than those who experimented with marijuana exclusively. Early onset into drugs is emerging as a consistently crucial risk factor for progression to other drugs (Robins 1984; Yamaguchi and Kandel 1984b). Early onset into drug use lengthens the period of time during a formative period of the life cycle when young persons experience the effects of a drug. The issue of self-selection, however, cannot be dismissed. Early initiators self-select themselves into early use and are already different from their peers. Therefore, can one naively assume that by postponing initiation into drugs one will simultaneously change adolescents in such a way that their chances of subsequent involvement in other drugs will be substantially reduced, or will one simply shortcut a process in which risk-taking and nonconforming tendencies will express themselves eventually in the use of drugs other than marijuana or in other ways?

The true challenge of prevention efforts is to address this issue. These efforts have to be designed in such a way that the postponement of initiation into drugs, and especially marijuana, is accompanied by changes in individuals, on the one hand, and the social environment, on the other hand, so that the delay will truly reduce the risk for subsequent participation in the use of various drugs and self-destructive behaviors on the part of young people. In this respect, the comprehensive approach suggested by Perry and Jessor (1984) involving a merging of the principles underlying the promotion of health and the prevention of drug abuse appears most promising.

FOOTNOTE

[1]Although validity of recall has been previously established for reports of certain drug use patterns (Ball 1967; Parry et al. 1970-71), underreporting, telescoping, and distortions have generally been shown to affect recall of various life events (Uhlenhuth et al. 1977). However, as stressed by Featherman (1980), distortions in retrospective reports may not necessarily be greater than those in contemporaneous reports. In the earlier phase of the research carried out in high school, we found that inconsistencies in self-reported patterns of drug use over a 6-month interval were associated with light patterns of use (Single et al. 1975).

In order to assess the validity of retrospective reports in the followup interviews, we relied on two strategies. We compared (1) reports in 1980 for similar events reported on in 1971, and (2) rates of retrospective self-reported drug use for 1977 with rates for the same age cohort interviewed contemporaneously in 1977 in the General Household Survey (Fishburne et al. 1980). The majority of recalled use patterns are consistent with those reported in 1971, especially for marijuana: 79% of males and 85% of females give consistent reports, although young people who reported not using as high school students are more consistent than those who reported using. The marginal distribution in reported lifetime prevalence is identical at both points in time (27%), but only because an equal number of persons gave inconsistent reports from the initial nonusing (N=88) and using (N=86) groups. However, while in 1971, 259 adolescents reported to have already used 1980, only 173 (67%) of these same persons remembered having done so. The inconsistencies are larger for cigarettes and for alcohol than for marijuana. Thus, the distributions of self-reported users in 1971 were 71% for cigarettes and 86% for alcohol, whereas only 49% and 68%, respectively, recalled being users in 1980. Most of the inconsistencies represent failures to recall Time 1 use at Time 3. Similarly, there are discrepancies in the ages of onset of use recalled in young adulthood by those who had indicated in 1971 that they were already using certain drugs, with a greater proportion reporting a later age of onset than was reported initially.

Although there appears to be a consistent telescoping and foreshortening of time in the recall process, there must be gradual adjustments over the lifespan being recalled. The annual prevalence of marijuana use (44%) reported retrospectively for 1977 at age 12 to 22, 3 years prior to the 1980 interview, is almost identical to that reported contemporaneously by members of parallel birth cohorts in the General Household Survey (Fishburne et al. 1980: Table 18). In 1977, 41% of persons aged 18 to 21 and 36% of those 22 to 25 reported using marijuana in the last year. (Given the tabulations in the report on the General Household Survey, more exact age comparisons cannot be made.)

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Patterns and Consequences of Cocaine Use

Dale D. Chitwood

INTRODUCTION

The significant public health issue involving cocaine is: "What are the consequences of cocaine use?" This question has received a variety of inconsistent answers during the last 100 years. Praised as a wonder drug by physicians in the late 1800s, reviled as the demon drug of black Americans by persons caught up in the racial fear and bigotry of the first quarter of this century, and touted as the ultimate aphrodisiac in various eras, cocaine has entered the mid-1980s with an abundance of mythology still intact (Siegel 1984; Phillips and Wynne 1980; Musto 1973). During the popularization of cocaine in the 1970s, some commentators emphasized, albeit cautiously, the more benign aspects of the drug (Ashley 1975). Recent investigations indicate that cocaine use has produced serious adverse effects (Mittleman and Wetli 1984; Siegel 1984; Washton and Tatarsky 1984). Because illicit cocaine use occurs in settings that do not readily lend themselves to experimental inquiry, additional nonexperimental investigation is needed to further differentiate reality from the mythology that surrounds cocaine use.

Knowledge about the consequences of use is limited, and many questions about the relationship between use and consequences remain unanswered. Nonexperimental research into that relationship will advance more rapidly as researchers begin to apply more precise definitions to concepts of cocaine use. Unfortunately, terminology used to describe drug-using behavior has not been standardized (Cisin et al. 1978), and labels for use patterns, such as "chronic abuser," have been defined in various ways without being defined at all. A decade ago the National Commission on Marihuana and Drug Abuse concluded that "drug using behavior is described by such an array of non-specific, unscientific and judgmental terms that it is often difficult to ascertain who is being described and what kind of behavior is being evaluated" (1973, p. 93). This problem is directly applicable to cocaine research. The assessment of cocaine use, beyond a use/nonuse determination, is complex and involves issues of initiation and cessation, route of ingestion, dose, frequency of use, use over time, and use in combination with other drugs.

The investigation of consequences is in an embryonic phase, and most inquiries have been exploratory studies which generate hypotheses but are not designed to test them. The failure to recognize the limitations of specific research designs of exploratory investigations can cause confusion. A case in point is the question of the dose-effect of cocaine--the relationship between degree of exposure (often referred to as pattern of use) and consequences. Disparate reports have surfaced about the role of route of ingestion, frequency, and quantity of use in the occurrence of adverse consequences. Experimental observations reported by Van Dyke and Byck (1982) indicate that acute consequences are related to these three elements of the pattern of cocaine use. Siegel (1984) concurs that persons who smoke freebase are more likely than intranasal users to report adverse health consequences. Conversely, Washton and Tatarsky (1984) observed no measurable dose-effect when they analyzed data from 55 phone interviews with users who called a hotline because they were experiencing adverse consequences. These researchers noted that equally substantial numbers of consequences were reported by respondents regardless of their route of ingestion, frequency, or quantity of cocaine use. Earlier, Helfrich et al. (1983) had studied the use patterns and consequences of 136 treatment clients who met the Diagnostic and Statistical Manual III criteria for cocaine abuse. They concluded that differences in the occurrence of consequences were associated with quantity of use but were not associated with route. At first blush, these latter two investigations appear to contradict the former studies which observed a dose effect, but this is not the case. Closer examination reveals that the principal intent of both studies was to demonstrate empirically that intranasal use, as well as infrequent use and use of small quantities, of cocaine can produce adverse consequences. Each did this by documenting, for example, that study participants who used cocaine intranasally reported the same number of consequences as were reported by intravenous users and freebase smokers. Confusion arose when the observed "no difference" in consequences by route of ingestion was interpreted as an indicator that there was no dose-effect. That conclusion would be inappropriate because the population of each study was by design so homogeneous in its "consequence" experience that users of each route of ingestion who were part of those populations would by definition reflect very similar consequences. The study designs were appropriate for addressing the question of whether intranasal users are part of the population that experiences adverse consequences, but were not appropriate to address the issue of whether intranasal users are as likely as freebase smokers or intravenous users to experience consequences.

Both exploratory and hypothesis-testing investigations of cocaine use and consequences will be enhanced to the extent that researchers carefully define how use and consequences of use are conceptualized and measured. This chapter addresses these issues by discussing:

1. Problems with the measurement of patterns of cocaine use, and

2. Problems with the measurement of consequences of use.

Data about patterns of cocaine use and physical consequences of use which are relevant to these issues are presented.

METHODOLOGY

The data reported in the paper are part of an investigation of a cocaine-using population in south Florida (Morningstar and Chitwood 1983). The primary purpose of the study was to describe differences in patterns of cocaine use. Between April 1980 and June 1981, a structured interview schedule was administered to a purposive sample of 95 treatment clients and 75 nonclients, all of whom were at least 18 years of age and reported cocaine to be a primary drug of use. Treatment clients were selected from the existing population of cocaine users who recently had entered a traditional drug treatment program, and nontreatment respondents were drawn through a network sampling procedure which enrolled respondents from several different user networks. Respondents were stratified on selected demographic variables (ethnicity, sex) and included Hispanic (primarily Cuban), non-Hispanic black, and non-Hispanic white male and female users of primarily middle and working class occupational cohorts. There were no statistically significant differences in the ethnicity, sex ratio, or occupational level of treatment and nontreatment respondents (Chitwood and Morningstar 1985). Treatment clients reported information for the time period preceding entry into treatment, while nontreatment respondents provided data for the time period preceding the interview. (Data are presented as percentages in all tables, and P values for Chi-square are reported in tables 3 through 6.)

PROBLEMS WITH THE MEASUREMENT OF PATTERNS OF USE

Patterns of cocaine use have been approached from a variety of perspectives in nonexperimental research, including self-reported dichotomous use/nonuse measures (O'Donnell et al. 1976); multidimensional typologies based upon cocaine users' characterizations of themselves (Morningstar and Chitwood 1984) or upon the five categories of the National Commission on Marihuana and Drug Abuse (Siegel 1984); postmortem toxicological analyses for cocaine benzoylecgonine, a major metabolite (Mittleman and Wetli 1984); and self-reported use histories, including questions of lifetime use and specific items about route of administration, quantity, and frequency of use (Chitwood and Morningstar 1985; Washton and Tatarsky 1984). Experimental studies define exposure in terms of precise quantities of cocaine administered via specified routes under experimental conditions (Van Dyke and Byck 1982).

Each of these approaches is potentially useful in its own right, but each one also has limitations. A dichotomous use/nonuse measure is essential to address the question "Do cocaine users

manifest more consequences than nonusers?" But, such a measure is not relevant to the dose-effect question which requires more extensive analyses about those who use cocaine. Cocaine users' perceptions of types of users provide insight into user beliefs about exposure and effect, and multidimensional typologies, based upon the National Commission's work, present a broad perspective of the lifestyle of users. However, both of these typological approaches are problematic for dose-effect research, because they incorporate concepts of exposure and consequences into the definitions of the categories of types. The use of these definitions to measure exposure would produce a tautology. Experimental measures are ideal for investigations of acute, nonlife-threatening effects but are neither feasible nor ethically acceptable in studies of the relationship between longtime use and severe consequences. Toxicological approaches are technologically sophisticated, are useful in assessing quantity of cocaine ingested immediately prior to the testing, and provide valuable data on cocaine-related deaths. This approach, like the experimental design, is not feasible for assessing amount of cocaine ingested by users in the community over an extended period of time. Self-report measures avoid the restrictions of experimental settings but surrender the precision of the experiment. Epidemiologists have successfully used self-reported exposure to investigate the relationships between tobacco smoking and lung cancer (Doll and Hill 1954), and a similar approach would enhance the investigation of cocaine use.

Self-Reported Exposure to Cocaine: Patterns of Use Data

Exposure to cocaine encompasses a person's total history of use. Specific characteristics of initiation of use, use in combination with other drugs, temporary cessation of use, level of cocaine use, and use over time presented in this section document the complexity of data that should be considered when developing a measure of exposure.

Initiation of cocaine use. The ages of the study respondents when they first tried cocaine are recorded in table 1, along with the mean ages at which respondents first used other drugs. Most respondents initiated cocaine use in their late teens; 70% reported first use of cocaine between the ages of 16 and 22. When compared with the initiation of other drugs, cocaine had the second oldest mean age at initiation of use, 19.2 years. Other researchers also have reported that initiation of cocaine use usually occurs after the initiation of certain other categories of drugs (Clayton and Voss 1981; O'Donnell et al. 1976; Kandel and Faust 1975). Widespread availability of cocaine is a relatively recent phenomenon, and late age at initiation may decline among cohorts to whom cocaine is available during their initial years of drug use.

Initial use usually occurred at a party (15%) or other informal social setting (72%). Very few first used cocaine on a street corner (8%) or at work or school (5%). The introduction to cocaine for both men and women was dominated by men. Male

initiates were introduced primarily by male friends (68%) or male relatives (10%). Female initiates usually were introduced by a spouse or intimate male friend (34%) or other male friend (43%). In contrast to these friendship/intimate/other relationships, only 5% obtained their first cocaine from dealers and another 2% from a coworker. This pattern of male-dominated behavior did not end at the point of initiation, but remained a part of the career pattern of cocaine use for a majority of respondents. More than four out of five (82%) ingested cocaine intranasally on their first use experience, while the remaining 18% injected cocaine. On that occasion, most respondents ingested very small quantities of cocaine. Fifty percent used about one-tenth of a gram or less, and only 20% used one-quarter of a gram or more. When asked if they "got high" on that first use occasion, 82% said they had.

TABLE 1

Age at Initiation of Cocaine and Other Drug Use

Age at Initiation of Cocaine

Age	<16	16	17	18	19	20	21	22	>22	Total[a]
(%)	15	11	10	17	12	7	7	7	15	101%

Mean Age at Initiation of Use of Eleven Categories of Drugs

Drug Type	Number Who Ever Used	Mean Age at Initiation
Alcohol	168	13.6
Marijuana	170	15.3
Inhalants	100	16.4
Hallucinogens	115	17.7
Other Stimulants	133	18.0
Sedative-Tranquilizers	162	18.1
PCP	104	18.2
Heroin	107	18.6
Other Narcotics	112	18.8
COCAINE	170	19.2
Methaqualone	147	19.7

[a]Rounding causes total percentage to vary from 100 in some tables.

Cocaine in combination. Table 2 contains data about the frequency with which various drugs were used in combination with cocaine.

TABLE 2

Frequency With Which Respondents Use
Other Drugs When They Use Cocaine (N=170)
(Percentages)

Substance	Always or Almost Always (%)	About 75% of the Time (%)	About 50% of the Time (%)	About 25% of the Time (%)	A Few Times (%)	Never (%)	Total[a] (%)
Marijuana/Hashish	34	19	12	8	18	9	100
Alcohol	21	14	12	12	19	23	101
Methaqualone	11	9	12	11	17	41	101
Sedative/Tranquilizers Excluding Methaqualone	4	5	8	11	18	55	101
Heroin	6	5	5	11	14	60	101
Other Narcotics	4	5	4	7	19	61	100
Other Stimulants	1	3	1	5	8	81	99
Hallucinogens	0	1	2	2	11	85	101
Inhalants	1	1	0	1	11	86	100
PCP	0	0	1	1	12	86	100

[a]May vary from 100 due to rounding.

Respondents were asked, "When you use cocaine, how frequently do you use (each drug) in combination with cocaine?" The data indicate that when these respondents used cocaine:

More than one-half (53%) used marijuana at least 75% of the time;

More than one-third (35%) used alcohol at least 75% of the time;

One-fifth used methaqualone at least 75% of the time;

Eleven percent used heroin at least 75% of the time, but 6 out of 10 never used heroin in combination; and

Most respondents did not use other stimulants (82%), hallucinogens (85%), inhalants (86%), or PCP (86%) in combination.

The majority of the study respondents were polydrug users whose drug of choice was cocaine or cocaine in combination. Note that three of the drugs most frequently combined with cocaine were central nervous system depressants. The combination of cocaine and heroin has been popular for many years in the heroin user subculture and is known as a "speed ball." This combination produces a rollercoaster effect. Several respondents stated that they used alcohol or sedatives at the end of a cocaine session to come down, reduce agitation, ease crash effects, or facilitate sleep. Since cocaine is frequently combined with depressants, increases in cocaine use may be accompanied by increased use of these drugs.

The use of cocaine in combination introduces a problem of confounding, i.e., the possibility that observed associations between cocaine use and the occurrence of an adverse consequence is not the result of cocaine use but the product of the ingestion of another drug used in combination with cocaine. The present study was designed to describe patterns of cocaine use among various user groups. One finding was that most cocaine users were polydrug users, but the untangling of the effects of cocaine used alone from cocaine used in combination with other drugs will require a followup study which will stratify the sample to insure that a sufficient number of respondents who only use cocaine are enrolled.

Voluntary cessation of cocaine use. Respondents also were asked if they voluntarily had stopped using cocaine for 1 month or longer. Two-thirds of the study sample had stopped using cocaine on at least one occasion, and approximately four out of ten reported voluntary cessation on at least three occasions. Of those who had voluntarily stopped using cocaine, 18% did so out of fear of negative health consequences, 3% suspended use because of existing health problems, 12% were pressured by family or friends to cease use, and another 12% stopped because the cost of cocaine was too high. About half of those who had temporarily stopped using cocaine reported other unspecified reasons.

Level of cocaine use index. The level of cocaine use index used in this paper is a summated 13-point index which gives equal weight to self-reported route of ingestion, frequency of use, and quantity of use. These three factors were previously identified as variables which are associated with variation in physiological effects (Gay 1982; Van Dyke and Byck 1982; Spotts and Shontz 1980; Resnick and Schuyten-Resnick 1976; Grinspoon and Bakalar 1976). Each has been identified by users as a discriminating characteristic of indigenous typologies of cocaine use (Morningstar and Chitwood 1984). Criterion validity was established by item analysis, and inter-item correlations indicated that each of the three components makes an independent contribution to the index. A complete description appears elsewhere (Morningstar and Chitwood 1983).

Respondents were asked to recall specific timespans of use, e.g., initial year, heaviest use period, and past 3 months. A series of questions was asked about use during each period, and index values were calculated for each time period. In this chapter, index scores are collapsed into three categories:

Low-Level Use:	Primarily intranasal ingestion no more than weekly of less than 1 gram per occasion.
Medium-Level Use:	Usually intranasal ingestion more than weekly of more than 1 gram per occasion or intravenous ingestion up to once a week of less than 1 gram per occasion.
High-Level Use:	Primarily intravenous ingestion daily of more than 1 gram per occasion.

This index represents a first step in the development of a replicable measure of cocaine use and is not without limitations. Questions concerning the cutting points may be raised and the summation of items which technically are more ordinal than interval in nature may be challenged. Nevertheless, as the item analysis and inter-item data indicate, the index appears to include independent contributions from three important elements of cocaine use.

Variation in use across time. Individual variation was assessed by calculating a level of use index score for each user's initial year, heaviest period of use, and past 3 months of use (figure 1). The data indicate that users tended to initiate at a low level of use and progress to higher levels in subsequent years. Approximately one-half (48%) were currently using at a level that was higher than that of their initial year of use. One-fifth of the study population had remained low-level users, but nearly as many (18%) had progressed from low-level use during their first year to high-level use at some time subsequent to that year. Forty percent had been high-level users some time during their use

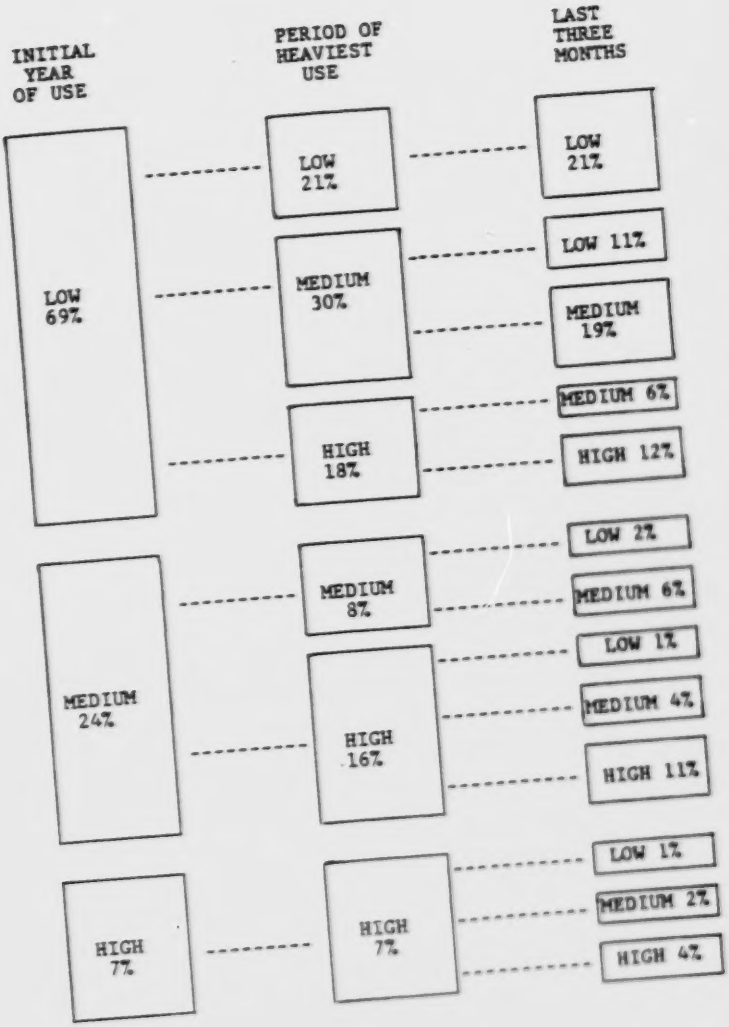

FIGURE 1

Levels of cocaine use over time

career. One-quarter of the respondents currently maintained a use level below that of their heaviest use period.

Because considerable variation in level of use across time was reported, a dilemma exists concerning the period of exposure that one chooses to use in the analysis. The solution requires specific information about the consequences being investigated, because the selection of the measure of exposure is predicated upon the nature of the dependent variable, consequences of use.

PROBLEMS WITH THE MEASUREMENT OF CONSEQUENCES OF USE

Most studies of illicit drug use have focused upon drug use as the dependent variable, but in studies of consequences, cocaine use is the independent variable. It is essential that the definition of consequences specify whether one is investigating incident effects, i.e., new cases of consequences which occur during a specified period of time, or prevalent effects, i.e., consequences present in the study population either at a specific point in time (point prevalence) or present at some moment within a specified period of time (period prevalence) (Lilienfeld and Lilienfeld 1980). Measurement also needs to be clearly delineated. Consequence data could be collected by means of clinical verification (at a physical examination or by a review of clinical records) or by self-report.

Self-Reported Consequences: Lifetime Prevalence Data

The lifetime prevalence of consequences of cocaine use, reported in tables 3 through 6, is defined as the proportion of people who report ever having the disease or an adverse health condition which they attribute to the use of cocaine. Lifetime prevalence is reported because one purpose of this exploratory study was to describe the extent to which users had ever experienced specific consequences of use. The existence of certain consequences reported here, such as an abscess, potentially is clinically verifiable. However, clinical verification of lifetime prevalence would necessitate a retrospective review of clinical records and could capture only those episodes for which the user received medical care. Other consequences of interest, such as nausea, seldom are clinically verifiable because they are transitory, are defined to a considerable extent by the user, usually are treated by the user who does not seek professional care, and are not readily externally verifiable. Data reported here were collected by self-report because the spectrum of consequences being investigated and the timespan of interest made clinical verification impractical.

The measure of exposure reported in tables 3 through 6 is the level of cocaine use during the respondent's period of heaviest use. This exposure was selected upon the supposition that dose-effect for lifetime prevalence would more likely be associated with heaviest use than with current use.

Physical Health Consequences. Respondents were asked to report the presence of a variety of physical health problems during their lifetime and to indicate whether each condition was related to cocaine use. Five "route of ingestion related" and five "general health" consequences attributed to cocaine use are reported in the following two paragraphs. For each health condition, lifetime prevalence by level of heaviest cocaine use is reported in table 3, and lifetime prevalence by route of ingestion, frequency of use, and quantity of use is presented in table 4. The following discussion of health consequences includes data from both tables.

No significant differences were observed in the proportion of low-, medium-, and high-level users who reported ever experiencing rhinitis or an ulcerated (or perforated) nasal septum (table 3). These conditions are known to be produced through intranasal ingestion, and data in table 4 indicate that persons who had used cocaine intranasally during their heaviest use period were almost twice as likely to report rhinitis and three times as likely to report an ulcerated septum. Abscesses, other skin infections, and hepatitis (consequences identified with the use of nonsterile needles) were reported most often by high-level users. Route of ingestion was associated with the presence of these problems; intravenous users were four times more likely to report these consequences.

High-level users were considerably more likely to report a physically rundown condition, lack of appetite, insomnia, and a lack of sexual interest (table 3). Similarly, persons who used 1 gram or more on each use occasion were more likely to have experienced each of these health conditions (table 4). This also was true for intravenous users (although differences in insomnia were not significantly different) and for persons who used more than once a week. Cocaine has been alleged to possess aphrodisiacal qualities, but ironically, 3 out of every 10 respondents had experienced a lack of sexual interest as a result of their use. Users of high levels of cocaine (43%) were five times more likely than low-level users (8%) to have experienced this symptom. One out of every ten respondents, none of whom were low-level users, reported overdosing on cocaine. High-level users were the most likely group to report an overdose episode. Overdose was much more common among persons who used intravenously, used more than once a week, or used 1 gram or more per occasion. Specific overdose symptoms are reported in the next section.

Side Effects. Respondents were asked the same question about each possible effect, "Tell me how frequently, if ever, you have had the following side effects or after effects when you used cocaine?" The lifetime prevalence of 12 side effects by level of use are reported in table 5, and lifetime prevalence of side effects by route, frequency, and quantity are presented in table 6.

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TABLE 3

Health Effects: Lifetime Prevalence by Heaviest Level of Cocaine Use (N=170)

Health Effects	Level of Cocaine Use				
	Low N=36 (%)	Medium N=66 (%)	High N=68 (%)	Total N=170 (%)	P
Route of Ingestion Related					
Rhinitis	36	41	30	36	NS
Ulcerated Nasal Septum	3	14	12	11	NS
Abscess	3	7	15	10	NS
Other Skin Infections	0	3	9	5	*
Hepatitis	0	3	12	6	**
General Symptoms					
Physically Run Down	19	47	71	51	***
Lack of Appetite	42	53	75	59	***
Insomnia	44	42	69	54	***
Lack of Sexual Interest	8	26	43	29	***
Cocaine Overdose	0	8	18	10	**

*p < .05
**p < .01
***p < .001

TABLE 4

Health Effects: Lifetime Prevalence by Route of Ingestion, Frequency of Use, and Dose During Period of Heaviest Use (N=170)

Health Effects	Route[+a]			Frequency			Dose		
	IN N=93 (%)	IV N=75 (%)	p	≤1/Wk N=35 (%)	>1/Wk N=135 (%)	p	<1 gram N=94 (%)	≥1 gram N=76 (%)	p
Route of Ingestion Related									
Rhinitis	44	25	**	29	37	NS	32	40	NS
Ulcerated or Perforated Nasal Septum	15	5	*	6	12	NS	7	15	NS
Abscess	4	16	**	3	11	NS	6	12	NS
Other Skin Infections	2	8	*	0	6	NS	2	8	*
Hepatitis	2	10	*	0	7	*	1	11	**
General Symptoms									
Physically Rundown	39	65	***	20	59	***	38	66	***
Lack of Appetite	51	70	**	43	64	**	53	67	*
Insomnia	48	60	NS	31	59	**	45	65	**
Lack of Sexual Interest	22	38	*	9	34	**	18	42	***
Cocaine Overdose	3	18	***	3	12	NS	4	17	**

[+]IN = Intranasal Use
IV = Intravenous Use
[a]Subjects who smoked freebase are not included.

*p < .05
**p < .01
***p < .001

Gay (1982) has outlined three stages of the "cocaine reaction." He characterizes the early stimulation stages of the cocaine reaction by excitement, headache, nausea, cold sweats, twitching, changes in blood pressure, and increased respiratory rate. Ten of the side effects reported in table 6 are indicators of this early stimulative phase. The least reported symptom in this phase, tremor, was noted by half of all respondents. Nearly three-fourths of all users in the high level of use category had experienced all 10 early phase side effects.

The advanced stimulative phase is characterized by convulsion resembling grand mal seizure; increased pulse rate and increased blood pressure; cyanosis; and rapid, gasping, or irregular respiration. Convulsion is probably the symptom of this phase which can be most validly and reliably elicited in a self-report situation. Twelve percent of the sample had convulsed on at least one occasion, and one-fifth of the high-level group of cases reported a convulsion.

The depressive phase includes symptoms of muscular paralysis, loss of reflexes, unconsciousness, circulatory and respiratory failure, and death. Once again, it is difficult to collect accurate self-report data on many of these symptoms. However, 15% of all respondents and 22% of the heavy use group reported loss of consciousness.

The most serious physical effect of cocaine use is the overdose, a somewhat elusive phenomenon since several users tended to equate overdose with death, and moderate or even severe overdose symptoms sometimes were not recognized as such by users. Many users said that they did not know it was possible to overdose. For example, while 10% of the respondents reported that they had overdosed on cocaine (table 3), 12% had experienced convulsions, 15% reported loss of consciousness (table 6), and 17% had experienced at least one of the latter two overdose symptoms.

Data from table 5 indicate level of use is positively associated with all 12 side effects. Data from table 6 indicate intranasal users are less likely to report these side effects. The same observation is true for persons using less than 1 gram (with the exception of dry or cotton mouth) and persons using less than once per week (with the exception of teeth grinding).

CONCLUSION

These data demonstrate that (at the zero order level of analysis) the level of cocaine use during heaviest use period and the route of ingestion, frequency, and quantity of use are associated with the lifetime prevalence of several self-reported health consequences and side effects. The findings of this exploratory investigation are consistent with other reports.

TABLE 5

Side Effects: Lifetime Prevalence by Heaviest Level of Cocaine Use (N=170)

Side Effects	Level of Cocaine Use				P
	Low N=36 (%)	Medium N=66 (%)	High N=68 (%)	Total N=170 (%)	
Early Stimulative Phase					
Dry Mouth or Cotton Mouth	67	86	93	85	***
Sweating	60	85	100	86	***
Irregular or Increased Heart Beat	64	88	100	88	***
Visual Distortion	22	61	75	58	***
Grind Teeth	47	67	75	66	**
Headache	22	58	79	59	***
Change in Breathing	31	62	82	63	***
Nausea	18	52	90	60	***
Dizziness	11	48	75	52	***
Tremors	25	42	71	50	***
Advanced Stimulative Phase					
Convulsions	0	9	21	12	**
Depressive Phase					
Unconsciousness	3	14	22	15	**

*p < .05
**p < .01
***p <.001

TABLE 6

Side Effects: Lifetime Prevalence by Route of Ingestion, Frequency of Use, and Dose During Heaviest Period of Use (N=170)

Side Effects	Route*a			Frequency			Dose		
	IN N=93 (%)	IV N=75 (%)	p	≥1/wk N=35 (%)	>1/wk N=135 (%)	p	<1 gram N=94 (%)	≥1 gram N=76 (%)	p
Early Stimulative Phase									
Dry Mouth or Cotton Mouth	78	92	**	71	88	**	83	86	NS
Sweating	76	97	***	69	90	***	81	92	*
Irregular or Increased Heart Beat	77	100	***	77	90	*	82	95	**
Visual Distortion	44	75	***	26	67	***	52	66	*
Grind Teeth	57	77	**	57	68	NS	57	76	**
Headache	43	78	***	29	67	***	50	70	**
Change in Breathing	50	80	***	37	70	***	54	75	**
Nausea	39	86	***	23	70	***	50	72	**
Dizziness	36	70	***	20	60	***	40	66	***
Tremors	37	67	***	29	56	**	43	60	*
Advanced Stimulative Phase									
Convulsions	5	20	**	0	15	**	5	20	**
Depressive Phase									
Unconsciousness	9	22	**	0	19	**	11	20	*

*IN = Intranasal Use
IV = Intravenous Use
[a]Subjects who smoked freebase are not included.

*p < .05
**p < .01
***p < .001

Nonexperimental research into the relationship between patterns and consequences of cocaine use will advance as we employ more precise terminology and more rigorous study design in our investigations. Medical epidemiologists have considerable experience examining the relationship between exposure to risk factors and the onset of disease that occurs in a nonexperimental, natural setting. Their investigations of the relationship between tobacco and lung cancer (or other respiratory disease) have overcome many of the problems that also are encountered in investigations of the relationship between patterns of cocaine use (as well as other drugs) and consequences of use.

The methodologies used in these investigations could be applied to the question of consequences of cocaine and other drug use. Although evidence from experimental and nonexperimental research indicates that adverse consequences have occurred following cocaine use, knowledge about relative and attributable risks of severe health and social consequences related to cocaine use remains unknown. The utilization of carefully designed case-control (Schlesselman 1982) and cohort studies will enable us to adequately address these public health questions.

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Cocaine Abuse: Neurochemistry, Phenomenology, and Treatment

Mark S. Gold, Arnold M. Washton, and Charles A. Dackis

INTRODUCTION

This chapter addresses three separate but related aspects of cocaine abuse problems. The first section summarizes some of the basic neurochemical aspects of cocaine, focusing on the noradrenergic, serotonergic, and dopaminergic systems in the central nervous system (CNS). The second section presents the results of several recent surveys of cocaine users who called our national telephone helpline, 800-COCAINE. These surveys highlight the nature of the current cocaine epidemic in the United States, providing data on demographics, patterns of use, and drug-related consequences in the largest samples of users to date. The third and final section of this chapter deals with clinical issues. We offer the benefit of our experience in treating cocaine abusers as inpatients and outpatients, with specific suggestions for effective treatment of the chronic cocaine abuser.

Some of the information in this chapter has appeared in other publications by our research group and the reader is referred to the original sources for further details.

NEUROCHEMISTRY

Norepinephrine

Adrenergic effects of cocaine were first reported in 1910 by Frohlich and Loewi, who demonstrated enhanced sensitivity to epinephrine in tissue exposed to cocaine. It now appears well established that cocaine blocks the reuptake of norepinephrine (NE) at adrenergic nerve endings (Langer and Enero 1974; Muscholl 1961; Just et al. 1977; Hawks et al. 1974; Whitby et al. 1960) as well as facilitates NE release (Farnebo and Hamberger 1971). This blockade of NE reuptake by cocaine is competitive (Langer and Enero 1974) and does not appear to result from its anesthetic action (Muscholl 1961). Furthermore, peripheral and central NE reuptake blockade is seen with cocaine concentrations which are consistent with those found in human cocaine abuse (Just et al. 1977; Hawks et al. 1974). Thus, while cocaine activates postsynaptic NE receptors and their associated target cells, NE

neurons themselves may be inhibited by this exogenous agent's activation of inhibitory presynaptic alpha-2 receptors located on NE neurons (Langer et al. 1980; Cedarbaum and Aghajanian 1977). This may explain how acute administration of cocaine causes an elevation in NE brain concentrations at 10 minutes, followed by marked reductions below normal levels at 20 minutes (Pradhan et al. 1978b). Similarly, receptor binding studies have demonstrated increased beta-receptor populations 12 hours following a single dose of cocaine (Banerjee et al. 1979). However, chronic cocaine administration produces even greater increases in beta-receptor density as well as increased alpha-receptor population (Banerjee et al. 1979; Chanda et al. 1979; Pert et al. 1979). Increased receptor sensitivity may explain some of the sensitization effects seen with chronic cocaine use. This would imply that cocaine administration leads to reduced NE turnover and inhibition of NE neurons--the predominant cocaine effect on this system (see table 1).

TABLE 1

Cocaine and Norepinephrine
(Tachycardia, Hypertension, Vasoconstriction,
Mydriasis, Diaphoresis, Tremor)

1. Blocks reuptake
2. Facilitates NE release
3. Activates tyrosine hydroxylase
4. NE cell bodies inhibited (d-2 effect)
5. Increased B-cell populations
6. Increased receptor sensitivity with chronic use

Net Effect: Decreased NE

Certain physiological effects of cocaine intoxication appear to result from sympathetic activation and can be explained by acutely potentiated central and peripheral NE neurotransmission. These include tachycardia, hypertension, vasoconstriction, mydriasis, diaphoresis, and tremor (Ritchie and Greene 1980). These autonomic signs can be produced in monkeys by electrically stimulating the pontine nucleus locus coeruleus (LC), which is the major NE nucleus of the brain (Redmond et al. 1976; Gold et al. 1980).

Dopamine

Dopamine (DA) neurons appear to mediate the euphoric response to cocaine and are thereby critical in self-administration of cocaine and the development of addictive use patterns. Certain effects of cocaine are dependent upon the integrity of DA systems. If a lesion in the nucleus accumbens is produced by the DA toxin 6-hydroxydopamine, animals will cease to self-administer cocaine

(Iversen 1966). Pretreatment with reserpine, which depletes catecholamines, will block cocaine-induced stereotypies and locomotor hyperactivity (Sayers and Handley 1973). Thus, cocaine effects which involve DA mechanisms are not produced by direct stimulation of DA receptors, but indirectly through presynaptic effects on DA neurons. Cocaine is a potent inhibitor of DA reuptake and appears to release this neurotransmitter (Whitby et al. 1960). DA reuptake inhibition has been confirmed in a number of studies (Iversen 1966; Ross and Renyi 1966; Trendelenburg and Graefe 1975; Taylor and Ho 1978; Scheel-Kruger 1971) and is consistent with acutely increased DA neurotransmission. A further reflection of increased synaptic availability of DA is the finding of elevated 3-methoxytyramine (DiGiulio et al. 1978) but normal homovanillic acid (HVA) concentrations (Fekete and Borsy 1971) after cocaine administration. Cocaine also causes reductions in brain DA concentrations with repeated administration (Taylor and Ho 1977). Cocaine elevates brain DA concentrations acutely, followed by reductions below normal levels several minutes later (Pradhan et al. 1978b).

Several studies have measured DA binding following chronic (Borison et al. 1979; Taylor et al. 1979) and acute (Memo et al. 1981) administration of cocaine. Memo and coworkers found a 37% increase in the number of DA receptors following a single dose of cocaine in rats. Consistent with increased binding sites was their finding that cocaine significantly potentiated DA-induced adenylate cyclase activity. Taylor and coworkers found that the increased DA receptor binding with repeated cocaine doses paralleled sensitization to gnawing behavior and locomotor changes. Thus, postsynaptic supersensitivity resulting from increased DA binding sites could underlie a number of cocaine effects in which sensitization has been reported. Interestingly, amphetamine induces the opposite effect, leading to decreased DA receptor binding (Hanbauer et al. 1979, 1980) and a reversal of haloperidol-induced DA supersensitivity (Haracz and Tseng 1980), underscoring that caution should be taken when comparisons to cocaine are made. Cocaine has also been shown to inhibit DA vesicle binding, thereby exposing it to intracellular metabolism (Carlsson et al. 1963). As with receptor studies and DA brain concentration studies, the concept of DA depletion was again invoked to explain the neurochemical findings (see table 2).

It would appear that, although cocaine acutely blocks DA reuptake and produces increased DA neurotransmission, as well as increased DA brain concentration (Pradhan et al. 1978b), there follows a functional reduction in DA activity (Dackis and Gold 1985a; Gold and Dackis 1984). DA receptor studies imply chronic reductions of available synaptic DA with compensatory supersensitivity of postsynaptic receptors over time. Thus, the predominant DA disruption appears to be of compromised DA function. We have previously reported elevated prolactin levels in 15 male and 5 female cocaine abusers (Dackis et al. 1984). Since reporting this original pilot data, we have expanded the group of male cocaine abusers (N=18)

and studied 20 normal, age-matched male controls (Dackis et al. 1985). Prolactin levels in the recently abstinent cocaine patients were significantly greater than those of the controls. These elevations slowly decrease, but do not appear to normalize completely, after 2 weeks of cocaine abstinence. This finding is consistent with decreased functional DA tone (Gold and Dackis 1984).

TABLE 2

Cocaine and Dopamine
(Self-stimulation, Anorexia, Stereotypies, Hyperactivity, Sexual Excitement)

1. Blocks reuptake
2. Facilitates DA release
3. Activates tyrosine hydroxylase
4. Acute increase DA availability/neurotransmission
5. Increased DA receptors
6. Increased DA receptor sensitivity
7. Reduced brain DA concentrations (chronic)
8. Inhibits DA vesicle binding

Net Effect: Decreased DA

This DA depletion hypothesis could explain why chronic cocaine addicts repeatedly self-administer cocaine, often many times daily, as a way of transiently increasing synaptic DA. Post-synaptic DA deficiency is temporarily corrected by acute cocaine use. This availability is amplified by the supersensitivity of DA receptors. However, as the acute effects of cocaine wear off, further DA depletion may result with perpetuation of the cycle. This DA depletion could be experienced by the addict as craving for cocaine, which would explain the perceived need for successive cocaine doses throughout the day. Consistent with this hypothesis, we have observed intensified craving in recently abstinent cocaine addicts who were given DA blocking neuroleptics. Woolverton and Balster (1981) demonstrated that when low-dose haloperidol was given to rhesus monkeys who were lever pressing for cocaine, self-administration actually increased. This apparent attempt to overcome DA receptor blockade could parallel compulsive and repeated cocaine use by addicts as DA depletion develops (see table 2). These data and our clinical experience suggests that neuroleptics should be used with caution.

Cocaine-induced DA disruptions may also relate to several of its other clinical effects (Gold and Dackis 1984). The sexual excitement produced by cocaine may result from amygdaloid and DA effects (Gatz 1966). In fact, cocaine administration has reportedly caused spontaneous ejaculation without genital stimulation (Dimijian 1974). Chronic cocaine use can lead to impotence and

frigidity (Siegel 1982). Cocaine also appears to inhibit appetite via DA neurons in the lateral hypothalamus (Gropetti and DiGiulio 1976). Finally, the psychomotor activation characteristically seen with cocaine intoxication probably is a DA effect. This DA depletion and the previously mentioned NE depletion serve as the neurochemical basis for the open trials of tyrosine in cocaine withdrawal (Gold et al. 1983).

Serotonin

Repeated administration of cocaine markedly reduces both the concentrations of 5-hydroxytryptamine (5-HT) and its metabolite 5-hydroxyindoleacetic acid (5-HIAA) (Taylor and Ho 1977). Pradhan and coworkers (1978a) found that when rats were pretreated with 5-hydroxytryptophan (5-HTP) in order to reverse 5-HT depletion by cocaine, the subsequent administration of cocaine failed to produce behavioral stimulation. Other studies have elaborated on the 5-HT depleting effects of cocaine and found a reduced synthesis of 5-HT from its precursor, tryptophan (Knapp and Mandell 1972; Schubert et al. 1970). Knapp and Mandell reported an inhibition of the high affinity tryptophan uptake pump by cocaine, leading to reduced 5-HT synthesis on the basis of insufficient precursor levels. The rate-limiting enzyme in the synthesis of 5-HT from tryptophan is tryptophan hydroxylase. Soluble tryptophan hydroxylase activity is inhibited by cocaine (Taylor and Ho 1977), which further compromises the biosynthesis of 5-HT. This effect of cocaine on tryptophan hydroxylase is interestingly opposite to that seen with tyrosine hydroxylase, which was markedly activated (Taylor and Ho 1977). Thus, unlike the enhanced turnover found in NE and DA systems, 5-HT neurons respond to cocaine administration with reduced turnover.

The reduction in 5-HT turnover secondary to cocaine exposure has been hypothesized to result from the direct stimulation of postsynaptic 5-HT receptors (Taylor and Ho 1977; Friedman et al. 1975). This would represent a compensatory inhibition of 5-HT neurons, perhaps via a transsynaptic feedback system (Anden et al. 1971).

800-COCAINE: SURVEYS OF USERS

On May 6, 1983, we established the 800-COCAINE helpline to provide information crisis intervention and treatment referral to cocaine users, their family members, and treatment professionals. The large volume of calls to the helpline, frequently over 1,000 per day and now over 450,000 in its first 18 months of existence, has provided a unique research opportunity by allowing access to large numbers of cocaine users who would otherwise not be available for scientific or public analysis. We have now completed several surveys based on random samples of helpline callers who consented to an anonymous 30 to 40 minute telephone interview in which an extensive research questionnaire was administered to gather data on demographics, drug use, and drug-related consequences on the user's health and functioning. The results of these surveys have

formed the basis of several reports and publications (Gold 1984; Washton et al. 1983, 1984), some of which are summarized below.

NATIONAL SURVEY

This survey was conducted during the first 3 months of the helpline's existence using a simple random sample of 500 callers. While callers to the helpline may not be representative of all cocaine users, the sample included callers from 37 different States across the United States, with the majority (63%) from New York, New Jersey, California, and Florida. Data from the research questionnaire administered to callers revealed that 67% were male and 33% were female. Their ages ranged from 22 to 59 years ($\bar{X}$=30 years). Eighty-five percent were white and 15% were black or Hispanic. Their level of education was 14.1 years. Forty percent had annual incomes over $25,000 (see table 4). Their preferred route of cocaine administration was: intranasal (i.n.) 61%; freebase smoking (f.b.) 21%; and, intravenous (i.v.) 18%. Estimates of weekly cocaine use ranged from 1 to 32 grams per week. Frequency of cocaine use averaged 5.7 days per week; 48% used daily. At prices of $100 to $125 per gram, the average amount of money spent per week on cocaine was over $637 and ranged from $100 to $3,150.

TABLE 3

Incidence of Adverse Physical and Psychological Effects
(N=500)

Physical Effects	N	%
Sleep problems	410	82
Chronic fatigue	380	76
Severe headaches	300	60
Nasal sores, bleeding	291	58
Chronic cough, sore throat	228	46
Nausea, vomiting	193	39
Seizure, loss of consciousness	70	14
Psychological Effects		
Depression	415	83
Anxiety	416	83
Irritability	408	82
Apathy, laziness	328	66
Paranoia	326	65
Difficulty concentrating	323	65
Memory problems	287	57
Sexual disinterest	265	53
Panic attacks	248	50

Sixty-six percent said they felt addicted to cocaine, 75% said they had lost control over cocaine use, and 83% said they were unable to refuse cocaine when it was available. Despite repeated attempts to stop cocaine use, those that felt addicted said they were unable to stay away from cocaine for as long as 1 month. Sixty-eight percent reported using tranquilizers, marijuana, alcohol, or heroin to reduce the stimulant effects of cocaine or to relieve the dysphoric "crash" when cocaine effects wore off.

Over 90% reported adverse physical, psychological, and social/financial consequences associated with their cocaine use. The incidence of specific consequences are shown in table 3. In addition, they reported numerous personal losses which they attributed to cocaine use, including loss of: job (25%), spouse (25%), friends (44%), and all monetary resources (34%). They also reported automobile accidents (11%), fighting and violent arguments (59%), and attempted suicide (9%). Callers reported stealing from work, family, or friends (20%), and dealing cocaine (36%) to support their drug habit.

No consistent relationship was found between the type of reported consequences and either the weekly dose or frequency of cocaine use. Contrary to expectation, i.n. users reported patterns and consequences of cocaine use comparable to those of f.b. and i.v. users. This survey provides dramatic evidence of addictive patterns of cocaine use and severe drug-related dysfunction in a large sample of users.

Upper Income Users

Although cocaine use has now spread to virtually all levels of society, and particularly to the middle class (Stone et al. 1984; Gold 1984), cocaine is still, for the most part, associated with the "privileged" members of society--those with high incomes. Publicized drug use by famous athletes, entertainers, politicians, and other public figures has served not only to further glamourize the drug, but also to convey the notion that problems of drug dependency know no social or economic boundaries.

One phase of the survey (Washton et al. 1984a) focused on a subgroup of cocaine users who called the helpline and reported incomes over $50,000 per year. The purpose of this survey was to assess the negative impact of cocaine use in persons who have a high level of access to the drug by virtue of their high incomes. We were particularly interested in determining whether greater access to cocaine would be associated with higher levels of use and more severe drug-related problems. Toward this end, we compared selected aspects of the present data with an earlier hotline survey of primarily middle income cocaine users (Washton and Tatarsky 1983).

Our subjects were 70 callers to the 800-COCAINE helpline who were seeking assistance for their cocaine problem and reported an annual income over $50,000. Most were corporate executives,

salesmen, business owners, or professionals. Callers in this income bracket represent approximately 15% of the total population of cocaine-using callers to the helpline.

The sample consisted of 57 males (82%) and 13 females (18%) with a mean age of 31 years and an average of 16 years of education. Their annual income averaged $83,000. Eighty-five percent were white. They had been using cocaine for an average of 4 years, ranging from 3 months to 7 years. Current use averaged 15 grams per week (range 2 to 30 gms/wk) at an average cost of $100 per gram. Sixty-four percent were i.n. users, 21% were f.b. smokers, and 15% were i.v. users. Seventy percent reported using sedative/hypnotics or alcohol to counteract the overstimulation or rebound dysphoria (crash) from cocaine use. The initial pleasurable effects of cocaine that subjects considered the most desirable included feelings of euphoria, self-confidence, sexual arousal, increased energy, mental alertness, and instant relief of boredom or fatigue.

Similar to results of our earlier survey, over 70% said they felt addicted to cocaine, could not refuse the drug when it was available, found themselves unable to stop for at least 1 month, experienced significant distress without cocaine, and preferred cocaine to food, sex, family, friends, or recreational activities. Adverse physical, psychological, and social/financial consequences included: chronic fatigue (84%), health deterioration (57%), insomnia (91%), headaches (52%), loss of sexual desire (61%), depression (83%), irritability (87%), memory/concentration problems (71%), paranoid feelings (65%), impaired job functioning (14%), impaired relationships (60%), and depletion of all finances (26%). Cocaine-related suicide attempts (5%), automobile accidents (21%), and brain seizures with loss of consciousness (19%) were also reported.

Despite their high income, 19% were dealing cocaine and 18% were stealing from work, family, or friends to support their cocaine habit. Five percent had been arrested for a cocaine-related crime (dealing or possession), and 13% had lost their job due to cocaine use.

Upper income subjects used nearly twice as much cocaine on a weekly basis as the middle income users (15.0 gms/wk vs. 8.2 gms/wk) surveyed by Washton and Tatarsky (1983). This higher level of use was associated with a higher incidence of cocaine-related automobile accidents (21% vs. 6%) and a higher incidence of cocaine-induced brain seizures with loss of consciousness (19% vs. 11%).

These survey results point to the role of economic factors in determining drug access and drug-related consequences. Many of our subjects could spend enormous sums of money on cocaine and escalate to extremely high levels of use before encountering financial limitations, if at all. Middle income users, on the other hand, typically report that the high cost of cocaine is a major factor limiting their use--if they had more money they would

be using more cocaine. Some say that they do not become more severely dependent on cocaine simply because they cannot afford to increase their use. When access to cocaine increases as a result of lower drug prices or involvement in dealing, its usage escalates accordingly.

As compared to the average cocaine user, the upper income user is typically not as accountable for his/her time or whereabouts and is often able to shift responsibilities to associates or employees to compensate for their own drug-related dysfunction. Moreover, the typical upper income user tends to feel immune to the possibility of becoming a drug addict. Most seem to be in control of their lives (at least superficially), continue to coordinate busy schedules, earn substantial incomes, and have no history of serious drug abuse problems. They start using cocaine on a "social-recreational" basis and never expect to become dependent on a drug that is believed to be relatively harmless and nonaddictive. Treatment is also seen as an admission of defeat, contradicting an image of themselves as competent, successful, and invincible: qualities reinforced by cocaine. A severe crisis situation, such as impending bankruptcy, divorce, legal problems, or a debilitating depression is usually the precipitating factor that drives the upper income abuser into treatment.

Adolescent Users

Drug and alcohol abuse is one of the most serious health hazards affecting our youth. Studies of adolescent drug abuse have traditionally focused on alcohol, marijuana, and hallucinogens. Kandel (1983) has recently reported that the incidence of cocaine and stimulant abuse is increasing more rapidly than abuse of other drugs. In addition, the number of high school seniors that admit to having tried cocaine almost doubled from 9% in 1975 to 17% in 1983 (American Medical News 1984). Three percent of high school seniors reported daily use of cocaine in the month prior to the survey. Drug-using adolescents, as compared to those who do not use drugs, demonstrate significantly more runaways from home, less motivation to achieve at school, more suspensions or expulsions, more involvement in gang activity, more time spent "hanging out," more time spent sleeping, and a greater need for help with vocational training and other problems (Semlitz and Gold, in press; Gold et al., in press [1985b]).

Drug use is an important cause of adolescent mortality due to motor vehicle accidents and death by suicide. Tragically, the drug-abusing adolescent is less likely to seek help than a nonusing peer. A popular misconception is that adolescents do not abuse cocaine because the drug is too expensive for them to obtain large and regular supplies. Despite the high cost, adolescents do indeed have access to cocaine through dealing drugs, other criminal activity, and peer suppliers.

We have recently surveyed 64 adolescent cocaine users who called the helpline in May 1984 (Semlitz and Gold 1984). These adolescent callers were primarily from New York and New Jersey (25%), California (20%), Illinois (12%), and Pennsylvania (8%). The sample consisted of 28 females and 32 males with a mean age of 17 years. Fifty four (90%) were white. The average caller was an 11th grader who had been using cocaine for 15 months. Fifty-one (85%) were i.n. users, five (8%) were f.b. smokers, and four (7%) were i.v. users. Among the f.b. and i.v. users, all had started using cocaine by the i.n. route. At a street cost of $75 to $125 per gram, callers reported spending 0 to $5,000 per month on cocaine with an average of $440/month. While all were self-proclaimed problematic users, only 48% were daily users.

The average caller cited 12 of 22 possible negative psychiatric effects, including complaints of feeling jittery (70%), chronically anxious (78%), and depressed (68%). They also reported delusions (35%), exaggerated suspiciousness (70%), paranoia (72%), and compulsive behaviors such as combing hair, tapping feet, etc. (93%). Cognitive deficits included decreased concentration (65%) and as memory problems (63%), as well as loss of interest in friends (48%) and nondrug-related activity (62%). Seventeen (28%) had active thoughts of suicide and seven (12%) reported a suicide attempt.

They reported an average of 11 of 22 possible questionnaire items for adverse physical effects. The most commonly cited physical symptoms included sleep problems (78%) and chronic fatigue (68%). They also complained of constant sniffing or rubbing their nose (66%), runny nose (72%), sinus problems (63%), palpitations (65%), and nausea and vomiting (50%). An alarming 20% reported brain seizures with loss of consciousness induced by cocaine.

These adolescents also reported serious social and financial consequences from chronic cocaine use. Forty-two percent were dealing drugs and 35% had resorted to other illicit activity to obtain cocaine. Twenty percent had been arrested for a cocaine-related crime, 33% suffered school problems, and 18% had already been suspended or expelled from school or fired from a part-time job. Fifty-two percent reported a loss of friends, 75% reported fighting or violent arguments, 43% were in debt, and 38% had stolen money or property as a direct result of their cocaine use. Twelve percent of those who had stolen a car reported a cocaine-related traffic accident. Sixty-five percent of the callers felt addicted to cocaine, 70% felt a real need for the drug, 85% were unable to turn it down when it was available, and 70% were unable to remain abstinent from cocaine for as long as 1 month. Sixty percent felt they experienced withdrawal symptoms when they stopped using cocaine. They preferred cocaine to food (60%), friends (50%), family activity (68%), and sex (35%). The average caller listed 13 out of 23 dependency items. The popular belief that cocaine is a relatively benign drug, especially if used by the i.n. route, is challenged here and by the earlier national helpline survey of

adult users. Our adolescent subjects cited numerous serious medical, psychiatric, social, and financial consequences of their drug use. Moreover, it appears that the development of addictive patterns of cocaine use in adolescents is more rapid than in adults.

In the absence of preexisting family and school problems, regular cocaine use can lead to serious psychosocial dysfunction characterized by dealing drugs, stealing and other criminal activity, poor academic performance and suspension, loss of peer relationships, and isolation from families. This can lead to permanent life changes. Nonetheless, parents, teachers, and clinicians usually fail to detect use (Gold 1984). Tragically, few adolescents who telephoned the helpline wanted treatment. Seeking treatment may be more of a function of a catastrophe occurring than the degree of medical or psychological symptoms that are present.

The adolescent is particularly susceptible to the spectrum of physical effects because of his/her lower body weight and the simple fact that he/she is a developing organism. In addition, adolescents do not have the experience or judgment to compensate for their behavior while intoxicated. Although 67% believe that the medical consequences of cocaine use are moderate to severe, only 10% stopped use because of such effects. Chronic use typically leads to chronic depression, fatigue, and irritability. Peak use of cocaine occurs at a time when youth must make commitments to family and work roles and negotiate a firm self-image. Drug use is an identity, lifestyle, and 24 hour/day job. At best, psychosocial dwarfism or failure to develop or being "frozen in time" is the result. Consistent with other studies (Kandel 1983), our survey suggests that adolescent cocaine users experience more psychosocial problems than nonusers, including: school problems, absenteeism, antisocial acts involving interpersonal aggression, theft, traffic violations, motor vehicle accidents, and suicide. Unfortunately, the family is typically late in associating social and moral problems to drug use.

In this survey, we have profiled the typical adolescent helpline caller as a 17-year-old 11th grader who is chronically irritable, depressed, estranged from family and friends, doing poorly academically, and is suffering from sleeplessness, weight loss, and other health and behavioral problems. The time between first use and contacting the helpline is 15 months. Compulsive freebase and intravenous use is reliably preceded by "occasional" intranasal use.

New York: 1983 versus 1984

We have recently completed two separate surveys in the New York tristate area. The first survey was conducted in May 1983 and the second was conducted 1 year later in May 1984.

The more recent survey (table 4) shows a higher percentage of females, a higher percentage of lower income users, and a shift toward lower age groups. Less than 50% are now earning over $25,000 per year. While many are business executives, business owners, or professionals, the 1984 sample includes more students, blue-collar workers, technicians, clerical workers, and housewives than the 1983 sample.

TABLE 4

Demographics
(N = 200)

	1983	1984
Males	76%	58%
Females	24%	42%
White	81%	84%
Black/Hispanic	19%	16%
Income over $25,000	52%	40%
Age (years)	15-60 (X=31)	12-63 (X=28.5)
Education (years)	X = 13.2	X = 14.1

Table 5 shows that callers had been using cocaine for periods ranging from several months to 15 years before calling the help-line. Most were self-administering cocaine by "snorting" the drug through their nostrils; smaller percentages were injecting cocaine intravenously or smoking cocaine freebase. Nearly all f.b. and i.v. users started using cocaine by the i.n. route.

TABLE 5

Cocaine Use
(N = 200)

	1983	1984
History of use	3 mos-15 yrs (X=4.6 yrs)	1 mo-12 yrs (X=3.5 yrs)
Intranasal users	58%	60%
Freebase users	16%	27%
Intravenous users	26%	13%
Grams per week	1-20 (X=5.5)	.5-15 (X=6.2)
Cost per week	$75-$2,000 (X=$450)	$35-$1,500 (X=$430)
Other drug/alcohol use	66%	75%

Table 5 shows that in the 1 year between surveys there has been an increase in f.b. smoking as the preferred method of use coupled with a decline in i.v. use. The popularity of i.n. use has remained virtually unchanged. There has also been an increase in the weekly amount of cocaine used by helpline callers and a concomitant increase in the use of other drugs or alcohol to offset the negative aftereffects of cocaine (e.g., restlessness, irritability, depression, and overstimulation). It should be noted that the combined use of cocaine and either alcohol or other depressant drugs can be extremely dangerous. Thirty-four percent of the 1984 sample said they were dependent on a second drug. Moreover, when the brief stimulant effects of cocaine wear off, the user can become instantly stuporous or drunk from the previously ingested depressants; sometimes this happens behind the wheel of a car or in some other critical situation.

As shown in table 6, both surveys revealed that the majority of callers felt they were addicted. In addition, they had lost the ability to limit their use of cocaine, could not refuse the drug when it was available, felt distressed without it, preferred cocaine to the exclusion of almost everything else in their lives, and despite their desire to stop cocaine use, they had been unable to stay away from it for even 1 month. They felt addicted, acted like addicts, complained of withdrawal, and made life choices characteristic of addicts.

TABLE 6

Addiction
(N = 200)

	1983	1984
Feel addicted	63%	74%
Loss of control	74%	85%
Cannot refuse it	85%	85%
Unable to stop for 1 month	70%	76%
Feel distressed without it	52%	61%
Prefer cocaine to food, family, friends, recreation	70%	73%
Withdrawal Syndrome	66%	75%

Lastly, table 7 shows the social consequences of cocaine abuse in our survey samples. It is surprising that among these predominantly employed, middle class samples who were typically earning substantial incomes, so many would be resorting to illegal acts, such as stealing or drug distribution, to support their cocaine habit. Of particular interest is the striking increase in cocaine-related automobile accidents reported in the 1984 sample. This may be linked to the higher levels of cocaine use in the 1984 sample and the resulting greater use of alcohol and other sedatives to alleviate the cocaine "highs and lows."

TABLE 7

Adverse Social and Other Effects
(N = 200)

	1983	1984
Dealing cocaine to support habit	43%	47%
Stealing from work	20%	28%
Stealing from family or friends	28%	42%
Arrested for dealing or possession	17%	14%
Automobile accident on cocaine	9%	39%
Loss of job due to cocaine	16%	15%
Loss of spouse due to cocaine	30%	33%
In debt due to cocaine	46%	57%

TREATMENT OF COCAINE ABUSE

An initial decision must be made as to whether or not hospitalization is a necessary first step in the treatment process. In general, hospitalization is required only in severe cases where other options (e.g., outpatient treatment) do not seem appropriate in light of the patient's clinical status. The major indications for hospitalization include: (1) chronic freebase or intravenous use; (2) severe impairment of psychosocial functioning; (3) medical or psychiatric complications; (4) concurrent physical dependency on other addictive drugs such as alcohol, sedative-hypnotics, or opiates; and (5) inability or unwillingness to stop using cocaine as an outpatient. The primary goal of inpatient treatment should be to break the pattern of compulsive drug use and provide a medically safe and structured drug-free environment for beginning the recovery process. The program must first take complete control of the user and provide a staff intensive, drug abuse testing, proven drug-free environment. It must slowly relinquish control to the user and the new drug-free peer group while providing structured outpatient aftercare treatment to foster long-term recovery.

When hospitalization does not appear to be indicated, outpatient treatment can be started immediately. The goal of treatment should be complete abstinence from all mood-altering chemicals (including alcohol, marijuana, etc.) and adoption of a drug-free lifestyle. Most cocaine abusers are concurrently abusing alcohol or other sedative hypnotics to alleviate the unpleasant side effects of cocaine (i.e., the crash).

Although cocaine does not produce a stereotyped abstinence syndrome as with opiates or barbiturates, abrupt cessation of chronic high-dose use can result in a variety of physical symptoms, including drug craving, depression, irritability, anergia, amotivation, appetite changes, nausea, shaking, psychomotoric retardation, and irregular sleep patterns, hypersomnia, and intense urges

or cravings that may persist for a week or longer following cessation of use. If cocaine urges partially result from DA deficiency states, certain treatment interventions might be considered.

TABLE 8

Pharmacological Treatments for Cocaine Withdrawal

L-dopa
Apomorphine
Bromocriptine
Tyrosine
Thyroxin
Bupropion

Clinically, these experimental interventions might be used in patients with previous treatment failures. Urges for cocaine are readily described by addicts, and appear most frequent and intense during the first week of abstinence. Since these urges can lead to cocaine use and relapse, close observation during the period of greatest risk is certainly indicated.

Relief of these symptoms with pharmacological treatment (table 8) might allow patients to stop using cocaine more easily and might also be useful in the postcocaine recovery period. Although cocaine increases DA neurotransmission acutely, we have hypothesized that chronic administration may deplete DA in the brain (Gold and Dackis 1984). With chronic cocaine exposure, postsynaptic DA binding sites are increased (Taylor et al. 1979) and DA brain concentration is decreased (Taylor and Ho 1977). Cocaine abusers have hyperprolactinemia (Dackis et al. 1984), which is also suggestive of DA depletion. While DA activation might lead to cocaine euphoria, DA depletion states secondary to cocaine might be the chemical basis for craving (Gold and Dackis 1984). In order to test this hypothesis, and possibly identify a new pharmacological treatment for cocaine urges, we administered the DA agonist bromocriptine and placebo to two hospitalized cocaine abusers with severe urges for cocaine (Dackis and Gold 1985b).

Both patients were contemplating leaving the hospital to use cocaine, and each complained of depressed mood, anergia, suicidal ideation, and poor concentration. The patients were asked to rate the degree of craving for cocaine by marking a 100 mm line anywhere between "not at all" and "extremely." Scores were assigned according to the point marked, ranging between 0 and 100. Bromocriptine (0.625 mg p.o.) or placebo was then administered blindly and craving was again self-rated at varying time points. Both patients reported marked and consistent relief from cocaine craving after bromocriptine and were able to distinguish it from placebo in all of six trials. These preliminary data suggest that bromocriptine may be effective in the management of cocaine abuse.

The administration of bromocriptine would interestingly reverse two biological alterations that are associated with cocaine abuse--hyperprolactinemia and increased postsynaptic DA receptor density. These alterations are consistent with the interruption of DA neurotransmission, which may also underlie the development of cocaine craving.

Recent studies (Gold et al. 1983; Tennant and Rawson 1983) indicate that tyrosine (an amino acid), desipramine (a tricyclic antidepressant), and DA receptor agonist bromocriptine (Dackis and Gold 1985b) may be effective in relieving cocaine withdrawal. But, while they are of theoretical importance, the clinical utility of these and other agents in the treatment of chronic cocaine abuse remains to be determined.

Irrespective of pharmacological interventions, psychological approaches at present remain the most important aspect of treatment for cocaine addiction. These approaches, in our experience, are similar to those with proven efficacy for alcohol dependence. Self-help groups and education are quite effective in treating the vast majority of cocaine patients who are motivated for abstinence. The admission of powerlessness over cocaine is an important step for the addict, and is a prerequisite to accepting outside help and direction. In our experience, an optimal treatment plan for most patients includes the combination of individual therapy with participation in a cocaine recovery group led by a professional therapist. Group sessions provide positive role models, a ready made peer-support network, and an excellent forum for discussing a wide range of issues that are crucial to abstinence and recovery. In group sessions, patients should be encouraged to discuss drug urges, addictive thinking, and methods for avoiding potential relapses. Discussions should also focus on thoughts and feelings that may precipitate relapse, and on nondrug alternatives for coping with stressful situations and negative mood states. Issues pertaining to group process and interpersonal dynamics should also be discussed when indicated, but generally should not take priority over drug-related issues. Individual therapy sessions complement the group meetings, but should focus more on personal and psychodynamic issues pertaining to relationships, sexual functioning, self-esteem, family problems, and other issues underlying the drug use. Couples and/or family therapy sessions should also be included in the treatment plan when indicated.

Known specific and sensitive urine screening is essential to the success of outpatient treatment. Throughout the entire course of treatment, urine should be tested at least 2 to 3 times per week for cocaine and other commonly abused drugs (e.g., opiates, barbiturates, benzodiazepines, amphetamines, marijuana, etc.). Urine testing utilizing antibody-based, gas chromatography, or mass spectroscopy is a valuable treatment tool that helps to promote self-control efforts and also serves as an objective monitor of patient progress (Gold et al. 1985a). Patients are generally relieved to find that urine testing is a mandatory part

of the treatment and intuitively recognize its value in deterring drug use. Urine testing helps to identify patients who are either unable or unwilling to stop using cocaine and those who switch to other drugs (Gold 1984). An emerging pattern of frequent drug use should call for a revision of the patient's treatment plan. This revision may entail more frequent visits, completion of a specified drug-free period verified by urine tests or, where indicated, a period of hospitalization before continuing in outpatient treatment.

Our approach to outpatient treatment includes the use of specific relapse prevention strategies, some of which have been adapted from the earlier work of Marlatt (1980, 1982) with alcoholics. These strategies incorporate a variety of behavioral, cognitive, educational, and self-control techniques aimed at reducing the potential for relapse and have been described in detail elsewhere (Gold 1984; Washton et al. 1984).

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Reinforcement and Rapid Delivery Systems: Understanding Adverse Consequences of Cocaine

Sidney Cohen

INTRODUCTION

The powerful reinforcing properties of cocaine demand constant replenishment of supplies. This is particularly true when the rapid delivery systems are employed, but even the slower, less efficient absorption through the nasal mucosa can result in compulsive use. Dependence of the cocaine type produces an array of psychophysiological and physical disorders, many of which can be life-endangering. The prime deterrent is the inability to sustain the practice because supplies become unavailable. The user is then driven to obtain additional cocaine without particular regard for social constraints. A variety of paranoid, manic, and depressive psychotic states result with accidental, homicidal, or suicidal potentials.

Casualties are also encountered from the toxic effects of the drug, including its sympathomimetic properties, from the techniques of introducing the drug into the organism, and the physical depletion of the long-term, high-dose user.

In laboratory animals, the intravenous injection of cocaine serves to initiate and maintain specific behaviors required to obtain additional injections. Such repetitive behaviors are considered to be the equivalent of human cocaine-seeking and compulsive use patterns. Therefore, a brief review of how species as divergent as rodents and primates respond to cocaine rewards may be revealing about the cocaine-human interaction.

Animals will work more persistently at pressing a bar for cocaine than for any other drug, including opiates. They will choose the bar that provides higher doses and an electric shock in preference to one that offers lower doses without a shock. They will continue to self-administer cocaine despite foot shocks that are paired with the cocaine bolus (Balster and Schuster 1977).

Hungry animals will preferentially bar press for cocaine rather than for food (Aigner and Balster 1978). Male, nonhuman primates will continue to work for cocaine despite the presence of a receptive female in their cage. Under unlimited access conditions,

monkeys will bar press until exhausted or convulsing (Deneau et al. 1969). If the animal survives, it will return to the task of acquiring more cocaine (Thompson and Pickens 1970). In one experiment, the monkey continued to bar press despite the requirement that it took 12,800 presses to obtain a single dose of the drug. After the conditioned response to cocaine is extinguished, a single injection will reestablish the bar pressing activity.

Under limited access conditions, for example, when cocaine is unavailable for a few hours a day, the laboratory animal is able to regulate its bar pressing so that a fairly stable dose is acquired each day.

Under conditions of access to large amounts of cocaine the human response remarkably resembles that of the laboratory animal. Cocaine-dependent humans prefer it to all other activities. They will continue using until they are exhausted or the cocaine is depleted. They will exhibit behaviors markedly different from their precocaine lifestyle. Cocaine-driven humans will relegate all other drives and pleasures to a minor role in their lives. The drive for cocaine will compel them to perform unusual acts in comparison to former standards of conduct. If the cocaine-seeking behavior is extinguished, either cocaine or environmental cues associated with prior usage will cause physiologic and behavioral changes resembling cocaine use and will tend to result in relapse (Bridger et al. 1982; Stewart 1983).

It is clear that cocaine is a powerful reinforcer that can lead to life-attenuating behavior. Although certain people, because of personality structure or life situation, might become more easily overinvolved, it is likely that anyone with access to cocaine in quantity is at risk. All laboratory animals can become compulsive cocaine users. The same might be said of humans. Instances of mature, stable, well-integrated individuals who acquired a pervasive craving for cocaine are well known.

CONSEQUENCES OF COCAINE USE DUE TO ITS REINFORCING PROPERTIES

Serious mental and physical consequences can result from the intense reinforcing nature of the drug. With intravenous use, coca paste smoking, or the inhalation of cocaine alkaloid vapors (freebasing), the desired mood-altering effects are detectable in seconds and disappear in a few minutes (Siegel 1982). This means an immediate reward with a rapid decline to baseline mood levels or below. Both the positive and the negative reinforcers drive the person to consume more cocaine. When cocaine is sniffed, the curve has a lower peak and a longer duration, but compulsive, incessant patterns of usage with nasal absorption are increasingly recorded in the literature (Helfrich et al. 1983).

Tolerance develops with the frequent use of large doses. A stimulant withdrawal syndrome is noted upon discontinuance, the major manifestation of which is a marked psychological depression

(the "coke blues"). The depression demands more cocaine for symptomatic relief, despite the transient nature of the mood elevation.

Finally, because of cortical dopaminergic exhaustion (Goeders and Smith 1983), or a refractory state of the receptors in the mesolimbic system, or both, cocaine can no longer evoke the hoped-for euphoria. Instead, dysphoria dominates. The same inability to achieve feelings of pleasure in response to ordinarily rewarding events extends into the postcocaine period. Anhedonia, the inability to enjoy, can persist for weeks.

The prognosis for successful treatment is obviously diminished when every aspect of the conditioning process serves to intensify a return to cocaine-using behavior: the desire for euphoria, the effort to avoid dysphoria, the self-treatment of depression, and the painful, anhedonic period. If we were to design deliberately a chemical that would lock people into perpetual usage, it would probably resemble the neurophysiological properties of cocaine. The fact that cocaine does not ensnare everyone into compulsive use makes it even more insidious. Those who employ it only occasionally proclaim that it is a safe drug.

Why does the animal continue working for cocaine until emaciated, convulsing, or dead? Why does the human continue to persist in its use long after it has become a punishing experience? Is it possible that the reinforcing behavior becomes so fixed that it persists in the absence of any reward? Or is it the vain hope that the next fix will bring euphoria?

The strong reinforcing propensity of cocaine leads to other difficulties, most of which are caused by the large amounts of the drug placed into the biological system over time. Considerable weight loss and general debility can result. It is speculated that cocaine use evokes a diminished immune response due to the unphysiologic lifestyle or to the impact of cocaine upon the immune system.

The paranoid thought mode almost invariably seen in consistent users has led to accidents and homicides. Once manifest, the psychosis tends to recur on subsequent cocaine exposures (Kramer et al. 1967). Manicky behavior, insufficiently mentioned in connection with cocaine abuse, is common in the "coke head." Cocaine users have many of the criteria used to diagnose mania: impulsivity, distractibility, an expansive or irritable mood, overactivity, loquaciousness, a flight of ideas, and insomnia. Some of these can lead to a variety of maladaptive behaviors. The postcocaine depression, previously mentioned, can terminate in suicide in a few instances.

Serious disruptions within the family, on the job, and in social situations occur in out-of-control users. When cocaine becomes an obsession, thought is disorganized, judgment fails, and existence becomes dismal.

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When someone is locked into obligatory cocaine use, overdose is always a hazard; but since other causes of overdose exist, they will be dealt with separately.

CONSEQUENCES OF COCAINE USE DUE TO TOXICITY

Infrequent reports of individuals who did not survive a small dose of cocaine (20 mg) before surgery have been published in the anesthesia literature. These deaths are due to a congenital blood and liver esterase deficiency.

Large amounts of cocaine cause death by a variety of mechanisms. Ventricular fibrillation, cardiac arrest, and apnea are the common modes of death (Nanji and Filipenko 1984). Pulmonary edema and congestion of the viscera may be the only abnormalities found at autopsy.

Repeated convulsions can be lethal following cocaine use. This may be due to obstruction of the airway, severe lactic and respiratory acidosis, a serious failure of the heart rhythm, or inactivation of the respiratory center (Jonsson et al. 1983).

A few cases of cerebral hemorrhage resulting from the acute hypertension are recorded (Lichtenfeld et al. 1984; Caplan et al. 1982). The rupture is usually at the site of an aneurysm or anomalous vascular formation.

Rarely, the hyperthermia which is induced by hyperactivity, the vasoconstrictive effects of cocaine, and a specific action on the temperature-regulating center is sufficiently severe to cause death.

A surprising number of serious complications or deaths are caused by body packing, bringing cocaine across a border concealed in the gastrointestinal tract or vagina. A report from Miami (Caruana et al. 1984) records 50 instances within a 6-month period of cocaine-containing foreign bodies concealed in body cavities, and another from Los Angeles mentions 47 cases (McCarron and Wood 1983). Most of these were managed successfully by conservative measures; others developed intestinal obstruction and required surgery. Rupture of the container--which is usually a finger cot, condom, or machine-packaged device--is much more serious because 5 to 30 grams can be packed in each unit. Breakage of the latex sheath can produce death before the patient can be brought to a hospital or shortly thereafter. As much as 750 grams has been retrieved from the feces of a single body packer.

Hepatotoxicity is often observed in certain species, but it has not been reported with any frequency in humans. The explanation is probably that the breakdown of cocaine is variable. In humans and animals that esterify cocaine, a hepatotoxin is not formed. In those species in which the major metabolic pathway is norcocaine, the toxic norcocaine nitroxide is formed in sufficient quantities to produce a norcocaine-liver protein binding that is hepatotoxic (Kloss et al. 1984).

CONSEQUENCES OF COCAINE USE DUE TO THE ROUTE OF ADMINISTRATION

The intravenous delivery of cocaine is associated with all the hazards that accompany the unsterile introduction of other drugs into a vein. Thrombophlebitis, hepatitis, AIDS, and bloodstream infections are all documented. Fungal cerebritis has been found, and the authors (Wetli et al. 1984) speculate that a diminished immune responsivity caused the opportunistic infection.

The practice of inhaling or smoking cocaine is reported to produce a significant reduction of carbon monoxide diffusing capacity, suggesting that depositing cocaine alkaloid in the alveoli damages the pulmonary gas exchange surface (Weiss et al. 1981). This alteration in respiratory function was found during the cocaine-free interval, indicating that long-term effects of regular use of freebase may lead to sustained pulmonary damage. Clinical reports of hoarseness, bronchitis, and bloody expectoration are increasing.

Complications associated with snorting cocaine include rhinitis, ethmoiditis, sinusitis, bleeding, and ulceration of the nasal mucosa. Perforation of the nasal septum can result from prolonged intranasal use and often requires plastic surgery.

COMPLICATIONS CAUSED BY THE INTERACTION OF COCAINE WITH DISEASES AND OTHER DRUGS

People with coronary insufficiency are at risk when using cocaine because the tachycardia and vasoconstriction may reduce cardiac oxygenation while increasing oxygen demand. Sudden deaths have occurred in people with a history of angina, with cocaine powder still visible in their nostrils. Blood glucose levels of diabetics tend to go out of control (either hypoglycemia or hyperglycemia), not only because of poor food intake and irregular medication-taking, but also because cocaine sensitizes the organism to epinephrine, which mobilizes glucose. Cocaine lowers the seizure threshold, and is contraindicated in epileptics.

Cocaine interferes with the antihypertensive effect of guanethidine (Ismelin) and related drugs because of its sensitizing effect on catecholamines. Using epinephrine and norephinephrine along with cocaine will produce potentiation of the vasoconstrictive effects.

The notion that cocaine combined with heroin or another opiate may neutralize the untoward effects of the two drugs is unsupported by postmortem evidence. In fact, the "speedball" is more risky because at high doses both cocaine and the narcotics depress the respiratory center. At present, several cities are reporting more cocaine than heroin deaths, and about a quarter of the cocaine-related deaths reveal the presence of heroin.

DISCUSSION

We happen to be commemorating the centennial of an earlier cocaine epidemic while attempting to cope with the current outbreak. A century ago, cocaine was overused because it was the panacea of the day. It was taken for fatigue, neurasthenia, depression, alcoholism, and countless other disorders. Enthusiasm for it was enormous until the same undesired conditions emerged that we are seeing today: psychoses, paranoid states, the incapacity to function, and the inability to extricate oneself from cocaine. Furthermore, it cured nothing, but sometimes added to one's problems a fixation on cocaine. The epidemic subsided. Then, the available delivery systems were the oral and subcutaneous routes. Today, much more rapid and hyperphoric methods are being used. Will history repeat, or will we have to settle for a population of chronic cocaine consumers, as we have of chronic heroin users?

We have spoken of the cocaine trap: the inability to stop using despite the loss of pleasurable, and the upsurge of unpleasurable, effects. The cause may be an ingrained and, in some instances, irreversible conditioning. We have said less of the cocaine paradox: that what starts out as elation and hypomania ends as dysphoria and depression.

Have we reached the apogee of cocaine use? Probably not. Supplies are plentiful and prices are down. Treatment remains difficult, as might be predicted from our knowledge of the neuropsychology of cocaine. How can the intense reinforcing component be eliminated? Cingulotomies have been performed, but they are a matter of desperation and remain completely unproven. It is true that strong stimulant epidemics have a record of dying out, perhaps because the user's plight is highly visible and serves as a deterrent to those in the user's vicinity. The future of cocaine dependence remains obscure.

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Characteristics of Humans Volunteering for a Cocaine Research Project

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During the past 10 years, research in this laboratory has concentrated on the behavioral and physiological effects of psychotropic drugs in human volunteers. One of these ongoing projects is investigating the effects of intravenous and intranasal cocaine on a range of physiological and behavioral parameters, including performance and self-report measures (e.g., Fischman et al. 1976). Prior to acceptance, volunteers are screened to exclude those who would be inappropriate for physical or psychological reasons. In addition, extensive drug histories are obtained at this time. Only those volunteers with histories of intravenous cocaine use, including a period of 6 months when it was used at least twice weekly, are acceptable. To date, we have screened 291 volunteers for participation in these studies. This chapter reports the drug histories, medical problems, and other relevant demographic characteristics of volunteers who were accepted and rejected for this study. To gain some perspective on how deviant this group of volunteers might be, we have compared, where possible, their drug use histories with those of volunteers screened for another experimental study involving orally administered licit psychotropic drugs where no requirements were made on drug use history.

The data presented here were collected for purposes of screening volunteers for drug studies rather than for purposes of analyzing patterns of drug taking. Thus, although they are not as complete as one might hope, the data do provide information on drug use patterns in a unique population. More specifically, these volunteer subjects are a group of polydrug abusers with extensive cocaine use histories, who are not currently seeking treatment for their drug use.

PROCEDURE

Subject Selection

Volunteers for the cocaine studies were recruited via a word-of-mouth referral system. No other advertising for subjects was used. Males or nonpregnant females between 21 and 35 years of age who were healthy (according to medical and psychiatric examinations) and had a history of nonmedical cocaine use were eligible

to participate. The basic criterion for acceptance into this study was a statement by the potential subject that he or she had used cocaine for nonmedical purposes on a twice weekly basis for a period of at least 6 months. To minimize the possibility that subjects falsified their drug history in order to gain acceptance, three interviews covering drug use issues were conducted by: (1) the research nurse, (2) one of the investigators (MWF), and (3) the internist who obtained a medical history and conducted a physical examination. In addition, the following criteria were used in subject selection:

1. Objective evidence of intravenous drug use (e.g., needle track marks).
2. Verification that the volunteer was knowledgeable about the community of stimulant drug abusers (subjects were asked who referred them).
3. If there was a suspicion of dependence on other drugs (e.g., heroin), the extent of the other habit was ascertained. Anyone known to be physically dependent on a drug was excluded from the study.
4. A full medical history and physical examination was conducted. Testing included ECG, chest film, blood screening (plasma cortisol, CBC, Chem-17, hepatitis), and urine analysis.
5. A psychiatric interview by a doctoral level psychiatric social case worker with extensive experience in diagnostics using DSM-III criteria.

We believe that we were successful in selecting only volunteers who had extensive histories of psychomotor stimulant abuse. Our multiple interviews about drug use revealed inconsistencies in answers which enabled us to discriminate and reject those who did not have the required drug history. Further, the applicants' description of preferred routes of administration, drug effects, etc., indicated sophistication about cocaine. Finally, among the 137 subjects who were selected and participated in this study, no one reported ill effects or elected not to continue the experiment because of drug effects.

A second group of subjects used as a comparison group was obtained from those volunteering to participate in studies on the behavioral effects of licit psychotherapeutic drugs carried out by Johanson and Uhlenhuth (e.g., 1980a, 1980b), also at the University of Chicago. These subjects were recruited with advertisements placed in student newspapers stating that drugs would be given orally in therapeutic doses to nonhospitalized research subjects. As a result, many of the volunteers were students. Although specific drug use histories were not required, these subjects received comparable drug history interviews. In addition, the same physician that obtained medical histories and physical examinations in the cocaine study also participated in screening these subjects. Therefore, we have used these data to make comparisons between the cocaine study and licit drug study volunteers. However, we do not suggest that this group should be

considered a control group for the volunteers in the cocaine experiment since their demographic characteristics differ in many important respects (e.g., level of education). Nevertheless, they do serve as a point of comparison for the cocaine experiment volunteers and also provide information about a different population within the same age range.

Data Analysis

The data on volunteers for the cocaine study came from the structured interview on drug use history (conducted by the research investigator). These data were checked for consistency with the other two interviews, and subjects were excluded where significant discrepancies existed. Medical data were obtained from the physicians' reports.

Potential subjects in each of the two studies were asked about use of specific drugs. For purposes of presentation, however, all illicit drugs were classified into six categories: hallucinogens, stimulants (other than cocaine), barbiturates, sedatives, opiates, and cannabis. In addition, subjects were asked about their use of alcohol, nicotine (any form of tobacco use), and caffeine (both coffee and other caffeine-containing beverages). For each drug category, two percentages were calculated as indices of drug use: (1) subjects who had never used that type of drug, and (2) subjects who had used that type of drug in the past month.

RESULTS

Demographic Characteristics

Table 1 lists the demographic characteristics of accepted and rejected volunteers for the cocaine experiment. The principal reasons for rejection were: medical (N=64), inadequate reading ability (N=22), and not meeting the criterion for cocaine use (N=13). Approximately two-thirds of the volunteers were males. This figure is inflated because during the first few years of this research the FDA required that we only use males. Thus, females were not given screening interviews. Since we have begun using women, approximately 40% of our applicants have been females. In general, our volunteers have been white, predominately males between the ages of 21 and 35. About 40% of the applicants were unemployed and an additional 12% were students. The educational level of the volunteers was reasonably high: 60% were high school graduates, 35% had some college, and 13% were college graduates. The relatively low number of black applicants and the even lower proportion of black applicants accepted into these studies requires comment. Our original volunteers were white males who lived in communities of people seeking alternative lifestyles (e.g., "hippie communes" in Michigan and Southern Illinois). Since subjects learned of these experiments from a word-of-mouth referral system, we tapped into social groups which tended to be racially homogeneous. Therefore, the number of blacks contacting us to participate in these experiments was low during the first

years of our research. More recently we have begun to make contact with the urban black population of drug abusers. The high rejection rate of blacks can be attributed to several reasons: there were a number who were either currently dependent on heroin (N=6), had poor veins because of extensive intravenous drug use (N=5), or had medical problems associated with previous intravenous use of drugs (e.g., hepatitis, liver enzyme abnormalities, pulmonary abnormalities).

TABLE 1

Demographic Characteristics of Volunteers

	Accepted N = 137	Rejected N = 150
Mean Age (Range)	27 (21-35)	28 (21-45)
	Percentage	Percentage
Sex		
Male	69	74
Female	31	26
Race		
White	85	59
Black	7	37
Other	0	3
Unknown	8	1
Employment		
Employed	42	33
Unemployed	30	53
Student	14	11
Unknown	14	3
Education		
H.S. Dropout	6	15
H.S. Graduate	59	60
College Graduate	16	10
Unknown	19	15

Drug Use History

We have looked at drug use history of the cocaine volunteers as a function of three variables: (1) males (N=197) versus females (N=73); (2) those who were accepted into the study (N=137) versus those rejected for medical reasons (N=64); and (3) those who completed college (N=36) versus those who dropped out of high school (N=31).

TABLE 2

Drugs Used in Last Month

Drug Class	Males (N=197) Percentage	Females (N=73) Percentage
Hallucinogens	15	15
Stimulants	63	62
Barbiturates	4	1
Sedatives	14	11
Opiates	22	18
Cannabis	84	68
Nicotine	73	64
Alcohol	87	82
Caffeine	85	84

Analysis of the drug use histories for males and females failed to reveal any differences in the percentages of those who had ever used any illicit drugs from each of the six categories. In addition, as can be seen in table 2, the pattern of drug use during the month immediately prior to the interview (presumably an indication of current drug preference) did not differ between males and females. There were also no marked differences in the percentages of males and females who used tobacco, alcohol, or caffeine-containing beverages.

A total of 64 volunteers for the cocaine study were rejected for medical reasons. As can be seen in table 3, the principal medical abnormalities were cardiovascular (25% high blood pressure; 11% heart disease; 9% abnormal ECGs). An additional 12% were rejected for dependence on heroin (10%) or alcohol (2%). It is of interest that only 7% of the rejected applicants (less than 1.4% of the total number of applicants) were rejected for a history of or current major depression and only 5% (less than 1% of the total number of applicants) were rejected for other psychiatric problems.

Table 4 shows the percentage of volunteers in the accepted group and the group rejected for medical reasons who had ever taken substances from the six categories of illicit drugs as well as alcohol, nicotine, and caffeine. As can be seen, all volunteers had used a wide range of illicit drugs in addition to cocaine. However, in this measure of drug use history, there appears to be no difference between those accepted and those rejected for medical reasons.

TABLE 3

Reasons for Medical Rejections
(N=64)

Reason	Percentage
High Blood Pressure	25
Heart Disease	11
Abnormal ECG	9
Positive Hepatitis	5
Possible Liver Damage	2
Abnormal Chest X-Ray	2
Major Depression	7
Other Psychiatric Illness	5
Heroin Dependence	10
Alcoholism	2

TABLE 4

Drugs Ever Used

	Accepted N=137	Rejected* N=64
Drug Class	Percentage	Percentage
Hallucinogens	39	43
Stimulants	92	93
Barbiturates	39	15
Sedatives	39	33
Opiates	46	57
Cannabis	91	92
Alcohol	95	88
Nicotine	72	74
Caffeine	89	84

*For medical reasons

Table 5 shows the distribution of drug use in the last month expressed as percentages for these two groups. These data strikingly illustrate the wide variety of current drug use by this population. Again, during the month preceding application for the study, there appears to be no difference in the drug use pattern for those accepted and those rejected for medical reasons.

TABLE 5

Drugs Taken in Last Month

Drug Class	Accepted N=137 Percentage	Rejected* N=64 Percentage
Hallucinogens	15	7
Stimulants	59	61
Barbiturates	5	0
Sedatives	11	16
Opiates	19	28
Cannabis	74	79
Alcohol	87	75
Nicotine	62	72
Caffeine	80	85

*For medical reasons

Another way of determining the degree to which these volunteers are polydrug abusers is to determine the number of different classes of illicit drugs that each individual has used. Subjects who were accepted and those rejected for medical reasons were compared on the basis of the number of different types of drugs they had ever self-administered for nonmedical purposes. Table 6 shows the percentage of people who had taken cocaine alone and cocaine in addition to drugs from 1, 2, 3, 4, 5, or 6 of the other classes of illicit drugs. As was shown in table 5, most cocaine users also used a variety of other types of drugs. Fifty-seven percent of the volunteers who were accepted into the experiment had used drugs from four or more classes in addition to cocaine. The group that was rejected for medical reasons showed a somewhat smaller diversity in the types of drugs they had used for nonmedical purposes (43% used four or more types of drugs in addition to cocaine). The diversity of drugs used by most of these people clearly precludes any analysis in terms of single drugs or even drug classes. These volunteers could best be characterized as being substance users rather than users of any specific drug.

Two subgroups of this population, college graduates versus high school dropouts, were compared using the same measure as above. Table 7 shows the percentage of each group reporting ever having used various classes of drugs. The results suggest several drug choice differences between these two groups: More of the college graduates used hallucinogens (67% versus 48%), whereas more of the high school dropouts used opiates (77% versus 33%) and nicotine (87% versus 58%). These same differences can be seen in table 8, which shows the percentage of each group using various

drugs during the month prior to the interview. Again, a greater percentage of the college graduates used hallucinogens during that month (28% versus 6%), but the opposite was true for opiates (6% versus 23%) and nicotine (51% versus 84%).

TABLE 6

Use of Cocaine Plus Marijuana Alone and in Conjunction With Illicit Drugs From 1-6 Other Classes

Cocaine Alone/ Combination	Accepted (N=137) Percentage	Rejected* (N=61) Percentage
Cocaine Alone	10	0
1	5	9
2	13	28
3	15	20
4	24	23
5	20	16
6	13	4

*For medical reasons

TABLE 7

Drugs Ever Used

Drug Class	College Grads (N=36) Percentage	H.S. Dropouts (N=31) Percentage
Hallucinogens	67	48
Stimulants	89	100
Barbiturates	28	42
Sedatives	44	39
Opiates	33	77
Cannabis	86	87
Alcohol	94	74
Nicotine	58	87
Caffeine	86	90

TABLE 8

Drugs Taken in Last Month

Drug Class	College Grads (N=36) Percentage	H.S. Dropouts (N=31) Percentage
Hallucinogens	28	6
Stimulants	61	61
Barbiturates	6	3
Sedatives	11	10
Opiates	6	23
Cannabis	86	71
Alcohol	89	68
Nicotine	51	84
Caffeine	81	90

The high school dropout group and the college graduate group were compared to determine whether there were any differences in the diversity of drugs used by each of them. The percentages of each group with histories of cocaine use alone and cocaine in addition to drugs from 1 to 6 of the other classes of illicit drugs are compared in table 9. As can be seen, both high school dropouts and college graduates had used a broad variety of illicit drugs, and there do not appear to be any differences between these two groups in this measure of polydrug abuse.

TABLE 9

Use of Cocaine Plus Marijuana Alone and in Conjunction With Illicit Drugs From 1-6 Other Classes

Cocaine Alone/ Combination	College Grads (N=31) Percentage	H.S. Dropouts (N=36) Percentage
Cocaine Alone	0	8
1	9	9
2	36	22
3	13	17
4	10	19
5	29	22
6	3	3

Comparison of Volunteers for the Licit Drug Studies

As stated previously, a number of licit drug studies by Johanson and her colleagues obtained information on illicit drug use histories as well as complete psychiatric and medical evaluations. These studies advertised for volunteers in student lounges and campus newspapers. The advertisement stated that therapeutic doses of commonly prescribed psychoactive drugs would be tested orally in these experiments. We selected 91 volunteers from this pool of applicants who were approximately matched in age to our volunteers for the cocaine study (27.6 versus 27.3 years of age) and in the proportion of males (67% versus 72%) and females (33% versus 28%). It was impossible, however, to match the volunteers from the two studies in terms of education level. As would be expected, the volunteers for the licit drug studies were mainly college graduates (76% versus 13%), with a high percentage (30%) having graduate training. It is highly probable that there are a number of other important demographic differences between the volunteers for the cocaine studies and for these licit drug studies. Nevertheless, the drug use patterns of both groups of volunteers are of interest.

Of the 91 applicants for the licit drug studies, 6 (approximately 6%) were rejected for medical reasons, in comparison to 64 out of the 291 (22%) applicants for the cocaine study. Although this large difference cannot necessarily be ascribed to differences in drug use, it is of interest that of the six applicants for the licit drug studies who were rejected for medical reasons, three had a history of extensive and frequent use of illicit drugs.

Table 10 shows the drug use history of the applicants for the licit drug study. As can be seen, a wide variety of illicit drugs was used by a substantial proportion of this population. Thirty-two percent reported that they had used cocaine at some time in the past. None, however, had taken cocaine on a continued basis. We did not ascertain the frequency and recency of this use of cocaine. As would be expected, 95% of this group used alcohol and 94% reported using it in the last month. In addition, 87% reported having used cannabis in the past, but only 21% reported using it in the last month. This is in striking contrast to the applicants for the cocaine studies, where 76% reported using marijuana during the last month. There was a substantially smaller percentage of applicants for the licit drug study than for the cocaine study who had ever used hallucinogens (29% versus 40%), barbiturates and sedatives (13% versus 33%), and opiates (13% versus 50%). The most striking difference between the two groups relates to tobacco use, where 73% of the cocaine versus 29% of the licit drug study applicants reported ever having used tobacco. It is of interest to note, though, that virtually all of those reporting that they had ever used tobacco also reported tobacco use in the last month. This is in marked contrast to marijuana, for example, where the percentage reporting ever having used is 87% but only 21% report using it in the last month. This suggests that those who try tobacco run a very high risk of going on to use it regularly.

TABLE 10

Drug Use Histories of Applicants
for Licit Drug Studies (N=91)

Drug Class	Percentage Ever Used	Percentage Used in Last Month
Hallucinogens	29	*
Stimulants	44	*
Sedatives	13	*
Opiates	13	*
Cannabis	87	21
Alcohol	95	94
Nicotine	29	28
Caffeine	94	94

*Not asked

In summary, as would be expected from the recruiting procedures, the applicants for the licit drug studies showed illicit drug use histories that would be predicted on the basis of their age and educational level. Nearly all of them drank alcohol (95%), most had tried marijuana (87%), and a smaller percentage had tried other illicit drugs. Overall, they appeared medically healthier than the volunteers who applied for the cocaine project. Whether this is because of differences in drug use or general lifestyles cannot be ascertained from the available data.

CONCLUSIONS

The information obtained from volunteers for these behavioral pharmacology research studies was for purposes of screening, not to provide epidemiological data. In retrospect, it is clear that the data, at least from the cocaine study, may be an important source of information about drug users who are not seeking treatment and who in general do not appear to be experiencing serious psychiatric consequences because of their drug use. This, of course, is in marked contrast to those cocaine users who are seeking treatment. It is important to note that, although the volunteers we have screened for the cocaine study are moderately heavy polydrug users (67% have used illicit drugs from four pharmacological classes), none seem to have currently "lost control" over their drug use. This statement is based not only on the interview data, but on the fact that no subject ever withdrew because of a need for more drug than was received in the experiment. In many instances, these research subjects were given only very low doses of cocaine on every second or third day during their 2-week hospital stay. Since we analyzed blood samples for cocaine and its metabolites every day, it is very unlikely that subjects were taking any cocaine except that which we administered. Further, they were monitored either by our research staff or the nurses at the Clinical Research Center where they

were housed. Thus, our subjects were able to go without cocaine (as well as other illicit drugs) for days without showing any psychological or physical disturbance. Further, these subjects did not report experiencing any precipitated craving following single injections of cocaine. It is quite likely that most individuals who are highly dependent upon cocaine or other drugs would not volunteer for experiments such as these since they could not be certain when and what kinds of drugs or dosage levels they would receive. It is also conceivable that "craving" for drugs may in part be environmentally triggered and, therefore, not experienced by our subjects in the novel hospital setting.

As noted previously, the volunteers for the cocaine research project had used a broad variety of illicit drugs on a frequent basis. When differences in physical or psychological health are found between such a population and those having minimal illicit drug use histories (e.g., volunteers for the licit drug studies), it is virtually impossible to determine which drugs or combinations of drugs are responsible. Tobacco and marijuana use in conjunction with freebasing of cocaine, for example, could clearly produce pulmonary problems. It would be unrealistic to attempt to delineate which of these substances was primarily responsible. A more realistic alternative is to deal with the psychiatric and physical health problems associated with illicit polydrug abuse. Prevention efforts which attempt to ascribe specific health problems to specific drugs often lead to fruitless debates about the degree of certainty of causality. What can be stated unequivocally is that polydrug abuse with attendant lack of attention to health and general lifestyle clearly places an individual at risk for serious physical and psychological consequences.

In conclusion, we would like to suggest that more attention be paid by laboratory researchers to the use of screening data that could provide interesting information on patterns and consequences of illicit drug use. It is obvious from the data presented that collaborative research protocols with epidemiologists would be fruitful and might allow these data to be collected more productively. Meetings, such as the one which resulted in this monograph, should stimulate the interaction of laboratory researchers, clinicians, and social scientists so that all relevant sources of illicit drug use information can be fully utilized.

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Characteristics of Cocaine Abusers Presenting for Treatment

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With the ever-changing patterns of chemical dependence problems, it has become increasingly evident that there is a current increase in cocaine abuse. Despite widespread publicity about this phenomenon in the lay press, there is little data available describing the characteristics of cocaine users. Chambers et al. (1972) studied the incidence of cocaine abuse among methadone maintenance patients in Philadelphia in 1969. In a similar paper, Gay et al. (1973) looked at the incidence of cocaine use in heroin users who were in treatment at the Haight-Ashbury Clinic during 1971 to 1972. The patients in both of these studies did not present for cocaine treatment specifically, but their cocaine use was studied in relation to their opiate abuse. Only in the past few years have a large enough number of primary cocaine abusers entered treatment to permit adequate study of this population. Anker and Crowley (1982) have described a population of users who presented for outpatient treatment in a contingency management program for cocaine abuse. Siegel (1982) studied a population of cocaine freebase smokers in the Los Angeles area. Both of these studies were based on information collected from outpatients and they presented limited information on the characteristics of the cocaine abusers.

In order to determine the directions necessary for future cocaine research, a detailed review of patients having received treatment for cocaine dependence in the Chemical Dependence Program of Northwestern Memorial Hospital in Chicago was undertaken.

The Chemical Dependence Program is a comprehensive treatment program providing treatment for all chemical dependencies, including alcohol. The program consists of an acute inpatient unit with an average length of stay of 18 days, a partial hospitalization program with an average length of stay of 4 weeks, and an outpatient clinic. In all components of the program, individual, group, and family therapy are provided along with educational seminars and peer support groups. Treatment is individualized as much as possible. During treatment, the primary focus is on the broad problem of addiction. There is no separation of patients based on their drug(s) of abuse.

METHODS

A detailed form was developed to generate information on patient demographics, cocaine use, other drug and alcohol use, employment status, education, previous psychiatric treatment, previous drug treatment, legal history, psychiatric diagnoses, medical diagnoses, laboratory data, medical sequelae, and behavior during treatment. All charts of patients admitted to the inpatient program with a diagnosis of cocaine dependence from September 1979 through June 1983, or admitted to the partial hospitalization component between March 1982 (when the partial program first started) and December 1983, were studied retrospectively. Patients who received treatment in both components of the program were not counted twice, but were reviewed as a single treatment episode. Where information was not available on the charts, it was recorded as missing. Patients were not contacted for followup information. The data presented in this paper are the combined data from the two program components based on a total of 172 patients.

RESULTS

During the period studied, there was an enormous increase in the number of patients with cocaine dependence presenting for treatment (table 1). No specific attempt was made to recruit cocaine-using patients. Over 50% of the patients studied were treated during 1983. This represents 55% of the patients admitted for inpatient treatment during that time period. The patients were predominantly male (69.2%), with 45.3% black and 45.3% white. The mean age at time of treatment was 30.384 years, with a range of 17 to 64 years (table 2).

TABLE 1

Percent of Patients Presenting With
Primary Diagnosis of Cocaine Dependence
September 1979 - December 1983

Year	N	Percent
1979	1	.6
1980	5	2.9
1981	15	8.7
1982	62	36.0
1983	89	51.8

TABLE 2

Demographics
(N=172)

Sex	N	Percent
Males	119	69.2
Females	53	30.8
Mean Age	30.384 (range 17-64)	
Race		
Black	78	45.3
White	78	45.3
Hispanic	15	8.7
Asian	1	.6

Only 30% of the population studied was married. Of those remaining, 36% had never married and 34% were separated, divorced, or widowed. Despite the large number of unmarried patients, only 41% of them were living alone. Of the unmarried patients living with persons other than their own children (51%), many were living with parents or friends/lovers because of financial problems which prevented them from living alone.

Over 83% of the patients had graduated from high school, with 60.9% having had some college education. Over 25% of the patients were college graduates, and over 4% had doctoral level degrees (table 3). Consistent with the educational level of the patients, 63.4% of the population was employed at the time of admission. Less than 16% of the population was receiving public assistance or disability payments (table 4). Of those who were employed, 52.4% were holding jobs in skilled positions, with 31.4% at managerial or professional levels (table 5).

Twenty-seven patients (15.7%) gave histories of dealing cocaine, with equal percentages of employed and unemployed reporting dealing. No data on dealing were available on 98 of the 172 patients. However, of the patients who did respond, 36.5% were dealing cocaine.

The smoking of cocaine freebase is the most efficient method of delivering high concentrations of cocaine rapidly to the central nervous system and was the most frequently used route of administration by the patients at the time of admission (43.9%) (table 6). The majority of patients were using cocaine daily (56.3%); the mean frequency of use was three to four times a week, and over 80% of the patients used the drug two to three times a week or more.

TABLE 3

Education

Level	N	Percent
Less than high school	1	.6
Some high school	27	15.8
High school graduate	39	22.8
Some college	61	35.7
College graduate	29	17.0
Masters	4	2.3
Postmasters	3	1.8
Doctorate	7	4.1
No information	1	Missing

TABLE 4

Employment Status

Status	N	Percent
Employed	86	50.0
Public aid	26	15.1
Unemployed	34	19.7
Self-employed, working	23	13.4
Self-employed, not working	2	1.2
Disability	1	.6

TABLE 5

Type of Employment

Type	N	Percent
Blue collar skilled	27	15.7
Manager/administrator	25	14.5
Clerical	19	11.0
Professional/technical	18	10.5
Sales	15	8.7
Blue collar unskilled	14	8.1
Service	13	7.6
Full-time homemaker	12	7.0
White collar skilled/ semiprofessional	11	6.4
Commodity broker	8	4.7
Not working	5	2.9
Student	4	2.3
Rehab work	1	.6

TABLE 6

Route of Cocaine Administration
at Time of Admission

Route	N	Percent
Freebase	75	43.9
Insufflation	59	34.5
Intravenous	37	21.6
No information	1	Missing

During the time period studied, cocaine had a street value of $100 to $120 a gram (gm). The average cost for cocaine reported by patients was $800 weekly. This is consistent with the reported amount of cocaine taken each time it was used and the weekly frequency of use (table 7). Patients reported a range of less than 1 gm to up to 30 gm each episode of use. The mean amount of cocaine used was 2 to 3 gm each episode (table 8). The patients using the largest quantities of cocaine at each episode were those smoking cocaine freebase. Most patients reported they would have used larger quantities of cocaine had they not consumed all that was available or had they not run out of money to purchase additional cocaine.

TABLE 7

Frequency of Cocaine Use

Frequency	N	Percent
Daily	94	56.3
4-5 times/week	11	6.6
3-4 times/week	11	6.6
2-3 times/week	18	10.8
1-2 times/week	13	7.8
Weekends only	15	9.0
Occasionally	5	3.0
No information	5	Missing

TABLE 8

Quantity Used at Each Administration

Quantity	N	Percent
1/4-3/4 gm	34	21.1
1- 2 gm	46	28.6
2- 3 gm	27	16.8
3- 4 gm	24	14.9
4- 5 gm	9	5.6
5-10 gm	13	8.1
10-20 gm	5	3.1
20-30 gm	3	1.8
No information	11	Missing

Despite an increase in cocaine's popularity over the past few years and the belief that cocaine abuse is a recent phenomenon, more than 9% of the patients had been using cocaine for over 5 years (table 9). However, over 87% had been using for less than 4 years, with 37% using for less than 6 months prior to entering treatment. Although the majority of patients had used cocaine for a relatively short period of time, over 65% of those on whom information was available (114) had tried to stop using cocaine at least once, and 17% had tried to stop three or more times without success. Of those who had tried to stop, information on the duration of the longest drug-free period was available on 101 subjects. Fifty-nine subjects (58.4%) were unable to remain drug free for more than a week. Seven patients had been able to remain drug free for over 2 years before returning to regular cocaine use.

TABLE 9

Duration of Use

Time	N	Percent
Less than or equal to 6 months	61	37.0
7-12 months	30	18.2
13-24 months	19	11.5
25-48 months	34	20.6
49-60 months	6	3.6
5-10 years	9	5.5
10-20 years	6	3.6
No information	7	Missing

Cocaine users often report using other drugs to modify the effects of their cocaine, usually to reduce excessive stimulation. The drug most commonly used to titrate cocaine's effects was alcohol. Of the 160 patients on whom we were able to collect the necessary information, only 10.6% reported no current use of alcohol. No current usage data was available on 18.8% (table 10). The patients who had provided information were often unaware of how much alcohol was consumed weekly until the information was requested. Over 36% of the patients were consuming more than two drinks of an alcoholic beverage daily, and 60% were consuming more than two drinks twice a week or more.

TABLE 10

Past and Concurrent Use of Other Drugs

Drug	N	Percent
Alcohol		
Current	143	89.4
Past use only	9	5.6
Never used	8	5.0
No information	12	Missing
Heroin		
Regular use with cocaine	38	25.9
Occasional use with cocaine	7	4.8
Occasional use without cocaine	2	1.4
Past use with cocaine	8	5.4
Past use without cocaine	20	13.6
No past use	72	49.0
No information	25	Missing
Marijuana		
Daily	69	42.9
4-5 times per week	6	3.7
2-3 times per week	10	6.2
1 time per week	4	2.5
Occasionally	30	18.6
Current use but no information	4	2.5
Past use only	18	11.2
No past use	20	12.4
No information	11	Missing

Sedative-hypnotics (barbiturates, sleeping pills, benzodiazepines) are also used to modify the effects of cocaine, and 32.9% of the 149 patients with sufficient information on the chart reported using these medications three or more times a week.

A drug often associated with cocaine use is heroin. Heroin can be used in combination with cocaine as an intravenous mixture (speedball) in which the cocaine is used to potentiate the effects of heroin. Heroin can be used also to reduce the stimulant effects of cocaine. Twenty-six percent of the 147 patients on whom data was available reported regular use of heroin with cocaine. Fifty-one percent of the patients reported current or past use of heroin either in conjunction with cocaine or separately.

Another drug often used to modify cocaine's effects is marijuana. Seventy-six percent of the patients reported current use of marijuana, with 42.9% reporting daily use of the drug. Besides smoking marijuana, 72.9% of the patients reported smoking cigarettes daily, with a mean usage of one pack a day for 7 years. Of all the drugs on which information was available, alcohol was the most frequently used in conjunction with cocaine (89.4%).

In contrast to other drugs, the cocaine users report little use of other stimulants. Over 68% report never having used stimulants other then cocaine, over 55% report no previous use of the hallucinogen lysergic acid diethylamide-25 (LSD), and less than 6% report any current use of LSD (or of stimulants).

As would be anticipated from the relatively short duration of cocaine use and the extensive use of other drugs among the study subjects, 97.9% reported using other drugs for a longer period of time than they had used cocaine. One-third of those on whom we had data reported loss of job due to cocaine, with 10.7% reporting an arrest for cocaine possession and over 5% reporting an arrest for cocaine dealing.

Despite the long history and high proportion of other drug use by the cocaine users seeking treatment, over 75% reported no previous inpatient or outpatient treatment for chemical dependence problems. Although 31.4% have had previous psychiatric outpatient treatment, less than 10% have ever had any inpatient psychiatric treatment.

It is generally believed that chemical dependence patients are unreliable and resistant to treatment efforts. However, this impression is not consistent with our experience with the cocaine users while they were in treatment. Less than 16% of the patients relapsed during treatment as defined by (a) having a urine toxicology positive for drugs or alcohol, or (b) reporting using drugs or alcohol during treatment. Over 65% of the patients were reported by staff to be cooperative during treatment and compliant with treatment recommendations. Seventy-two and one-half percent of the patients completed their inpatient or partial hospital treatment, with over 74% accepting the recommendation for continued treatment.

DISCUSSION

The data presented are helpful in attempting to develop a profile of the cocaine user who presents for treatment. Although increasing numbers of cocaine users are requesting treatment, it is important to remember that this is a skewed population and may not be representative of the cocaine user who is not presenting for treatment. In addition, there is no way of knowing what proportion of cocaine users the treatment population represents.

The population of users we are seeing have tended to use other drugs for a longer period of time than cocaine. Their cocaine use is relatively new, most often within the past 4 years. They view cocaine as the precipitant which brings them into treatment at this time. Since close to half the patients we have treated smoke freebase cocaine, this method of use may be an important factor in their seeking treatment. We have reported elsewhere on the pulmonary complications associated with cocaine smoking (Itkonen et al. 1984).

Despite the long history of using other drugs by most of the patients, few have sought or required previous treatment for their use of these drugs. However, they have entered treatment for cocaine dependence. Since it is well known that cocaine has powerful reinforcing properties (Aigner and Balster 1978; Johanson and Schuster 1975), the users may have been able to control their use of other drugs but not cocaine. The high cost of cocaine use (approximately $800 a week for those entering treatment) also may have contributed to the problems causing patients to seek treatment.

Once in treatment, the cocaine users are cooperative and tend to follow treatment recommendations. This cooperation during treatment may be related to the large percentage of patients who are employed in skilled and professional positions. Their employment status would indicate a strong ability to function within the rules of our social system, and problems in treatment could result in a loss of job. It has been well documented that patients who have the most to lose with a treatment failure have the best prognosis.

From this preliminary study, three groups of cocaine-dependent patients appear to be emerging: (1) patients who have no previous drug treatment experience but have broad experience with substances of high abuse potential; (2) patients who have a previous drug treatment history with cocaine being the most current drug in a long career of chemical dependency; and (3) patients with no or minimal previous drug experience who are older than the patients in groups 1 and 2 and seek treatment after a very short duration of cocaine abuse.

Additional research is needed to determine if the above groupings are supported by prospective studies of cocaine abusers. Other areas of research should focus on medical consequences of cocaine

use, comparison of cocaine-abusing patients with patients who abuse substances other than cocaine, personality characteristics of cocaine users, treatment approaches, and treatment outcome.

Since this population has had little previous exposure to the chemical dependence treatment system, they present a unique opportunity for future studies.

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Cocaine Use in a Treatment: Population: Patterns and Diagnostic Distinctions

Frank H. Gawin and Herbert D. Kleber

There has been little systematic or detailed study of cocaine use patterns in abusers. While there is a relative abundance of survey literature on cocaine use (Gold, this volume) and detailed case report data are available on cocaine abusers (Siegel 1982; Smith and Wesson 1980), the former does not enhance understanding or treatment of individuals and the latter often lacks generalizability and objective data collection techniques. Descriptions of abuse patterns in users appearing for treatment usually have been limited to documenting routes of administration. More detailed descriptions of the way cocaine is used could provide a basis for increasing our understanding of the spectrum of cocaine use and abuse. If the way cocaine is used differs consistently for different types of abusers, this might lead to specific insights or interventions in particular treatment subpopulations. This chapter describes data on amounts, routes, and temporal characteristics of cocaine use in an outpatient population, taken from periods immediately prior to treatment and during the early stage of treatment. The population was given extensive psychiatric and drug abuse characterization, enabling a preliminary assessment of possible relationships among all these factors.

METHODS

Subjects were 30 consecutive admissions to the Cocaine Abuse Treatment Program at the Drug Dependence Unit of Yale University School of Medicine and the Addiction Prevention Treatment Foundation. This outpatient program serves a middle-sized urban community as part of a comprehensive community mental health center. On admission to the program, subjects completed a 72-item demographic questionnaire and a 110-item drug and cocaine use history. They also were asked to complete a 28-item cocaine craving scale and cocaine use inventory each week during treatment and for each of the 2 weeks prior to admission. The inventory generated information on their cocaine use for a 1-week period including the total amount of use, days on which cocaine was used, number of discrete episodes of cocaine use separated by sleep (runs), length of cocaine run, and route(s) of administration.

Data were collected for the present study for 2 to 6 treatment weeks. If a period of abstinence, defined as greater than 2 weeks without any cocaine use, was achieved early in treatment, then data were counted only for those weeks before abstinence occurred. There were 182 data weeks for the entire sample. This included 2 pretreatment weeks and at least 2 weeks of active abuse for every subject. These methods were chosen following pilot investigations which showed that subjects' abilities to provide specific details for past usage was limited to the 2 to 4 weeks preceding admission. Estimates by subjects of earlier specific past usage patterns were unreliable.

An approximation of natural abuse patterns was thus obtained. This approximation assumed that patterns of abuse just before entering treatment and during the early treatment phase reflected typical street abuse.

DSM-III axis 1 psychiatric diagnoses were available on 17 of these subjects from associated studies of abstinence symptomatology and pharmacotherapy (Gawin and Kleber 1984a, 1984b). These diagnoses were obtained via structured interviews with the NIMH diagnostic interview schedule. The remaining 13 subjects did not receive structured interviews, but were also diagnosed using DSM-III criteria. Diagnostic patterns between the two groups were similar.

Before diagnoses were made, all subjects were required to meet additional criteria which were designed to minimize the influence on diagnosis of short-term dysphoric effects from a recent episode of cocaine use. The timing of diagnostic procedures in cocaine abusers is an important determinent of diagnostic reliability and validity because the postcocaine "crash" that follows an episode of substantial use can mimic the neurovegetative symptomatology of unipolar or bipolar depression. In most cases, the crash ends within 1 to 5 days and a baseline clinical state, which we have termed phase II, of cocaine discontinuation ensues. Symptom evaluations for diagnoses were made only during phase II; and historical reports were considered only if the symptoms described had occurred during prolonged (14 days) cocaine-free periods. Diagnostic considerations in cocaine abusers and these methods are discussed more fully elsewhere (Gawin and Kleber 1984b).

Formal statistical analyses of the data were not attempted because of the small sample size, as well as possible pseudoprecision stemming from numerical values generated on duration or amount of use of street cocaine, for which actual purity might be highly variable. We thus considered this an exploratory investigation to provide preliminary data and an initial assessment of the value of pursuing further investigations of this type.

RESULTS

Characteristics of the sample appear in table 1. Age, sex, race, education, income, and employment status are similar to those described by others for cocaine abusers in treatment (Weiss et al.

1983; Schnoll et al., this volume). An atypical feature of this sample is the very high proportion of intravenous (i.v.) cocaine users. The proportion of i.v. versus inhalation (smoking) users is inverse to that seen elsewhere (Schnoll, this volume), providing particular opportunity to observe patterns of use. Other features of cocaine usage for this sample are not atypical.

TABLE 1

Subject Characteristics
(N = 30)

Route of Administration:		
Intranasal (I.N.)	11	(37%)
Smoking (S)	6	(20%)
Intravenous (I.V.)	13	(43%)
Age: $\bar{x}$ = 28.6 (range = 19 - 37 years)		
Sex: 27% Female		
73% Male		
Education: $\bar{x}$ = 12.8 years (range = 9 - 18 years)		
Yearly Income: (excluding cocaine commerce)		
$\bar{x}$ = $22,560 (range = $7,000 - $84,500)		
Employment: 70% were regularly employed at entry		
Duration of Cocaine Use: $\bar{x}$ = 4.8 years since first use		
(range = 1.5 - 16 years)		
Estimated Amount of Cocaine Use in Prior 6 Months:		
$\bar{x}$ = 147.2 gms (range = 20 - 700)		
Race: 6% Hispanic		
13% Black		
80% Caucasian		

Characteristics of groups divided by administration routes (table 2) indicate few differences between the groups. Intravenous users had a slightly lower income and a higher percentage of non-Caucasians, but no differences exhibited in education. This may indicate different drug-using subcultures or differences in social acceptance of various routes of administration in the urban East as opposed to, for example, the West Coast. However, we cannot be certain of the factors that created the high proportion of i.v. abusers in our sample.

Over 60% of the intravenous users had tried freebase smoking and had not preferred it. In contrast, only one of six cocaine smokers had experimented with i.v. cocaine.

Cocaine use described for this population was very similar to that described for methamphetamine abusers over a decade ago by Kramer et al. (1967). That is, the predominant pattern of use in these abusers seeking treatment was in discrete episodes or "runs." Only four subjects described daily or near to daily cocaine use (greater than three use episodes weekly), and two of these

subjects described runs of high intensity use by intravenous injection that were interspersed with days of low use by intranasal administration. Over 50% of the entire sample reported that milder daily use of cocaine was part of their earlier abuse history. However, they described that as the severity of their abuse escalated, fewer periods of mild daily use occurred, and instead episodes of higher intensity prolonged use increased. The sample averaged 1.9 runs weekly, used 3.6 grams per run, and had a mean duration of 10.4 hours of cocaine use per run. ("Duration" of a run refers only to the period during which cocaine was self-administered, not to the duration of euphoria or of the post-cocaine crash.)

TABLE 2

Subject Characteristics by Preferred Route of Administration

	I.V.	S	I.N.
Age (years)	29.9	27.8	27.4
Sex (% female)	31	33	18
Income ($)	19,770	25,830	22,640
Education (years)	12.2	12.3	13.3
Employment (%)	69	67	73
Length of use (years)	5.9	3.8	3.6
Race (% non-Caucasian)	31	0	18
Prior Substance Treatment	54	50	27
Other DSM-III Dependence History (%)	8	0	0
DSM-III Alcohol Abuse History (%)	38	33	27

Patterns of cocaine use differed substantially according to route of administration (table 3). Both i.v. and i.n. users used approximately five grams of cocaine weekly, but in different patterns: the intranasal users would use lesser amounts over longer time periods but would have almost 50% more runs weekly. Cocaine freebase smokers used almost twice as much cocaine weekly as the other groups and almost twice as much per run as the rest of the sample, but also had runs that lasted 2 1/2 times as long as the i.v. users. These differences led us to define a term describing abuse in grams per hour: the "intensity" of cocaine use. As table 3 indicates, the mean intensity of use as well as range maximums indicate that i.v. users used very large amounts of cocaine in very short time periods. Our sample used from one-eighth to one gram per injection, with one to three injections per hour. These substantial boluses have important implications for our understanding of natural cocaine use patterns. In particular, they imply that both acute and chronic tolerance may occur and that the prior belief that a single lethal dosage of cocaine is approximately one gram may be erroneous.

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TABLE 3

Use Patterns by Route of Administration

	I.V.	S	I.N.
	(numbers in parentheses indicate range, other values are means)		
Grams of Cocaine: (Weekly)	5.6 (1-20)	9.1 (4-16)	5.3 (1.5-10)
"Runs" Per Week:	1.6 (.8-2.7)	1.6 (1-2.5)	2.3 (.5-6)
Grams Per Run:	3.7 (.8-7.5)	5.7 (3.6-9.6)	2.3 (1-6.5)
Duration of Run: (Hours)	6.9 (1-16)	17.4 (6.7-24.8)	10.7 (3.8-22)
Intensity: (Grams per hour during use)	.54 (.12-1.)	.35 (.21-.54)	.25 (.07-.52)

DSM-III axis 1 psychiatric diagnoses, in addition to substance abuse, were present in 54% of the sample and are presented in table 4. The diagnoses were primarily minor affective disorders (dysthymic and cyclothymic disorder) with major affective disorders present in only 13% of the sample. The only other diagnosis made was one case of Adult Attention Deficit Disorder (ADD)--Utah criteria were applied to arrive at this diagnosis (Wender et al. 1981). This distribution of axis 1 disorders is similar to that described in an earlier report on inpatients by Weiss et al. (1983). The highest proportion of diagnoses occurred in intra-nasal users, almost twice that observed in the freebase smokers.

TABLE 4

Axis 1 Diagnoses vs. Route of Administration

Sample	S (n = 6)	I.V. (n = 13)	I.N. (n = 11)	Total
Major Depression	1	2	1	4
Dysthymic	1	2	3	6
Cyclothymic	-	3	2	5
Adult Attention Deficit Disorder	-	-	1	1
None	4	6	4	14
Totals	2/6-33%	7/13-54%	7/11-64%	6/30-54%

Subjects given additional axis 1 diagnoses, with the marked exception of the subject with ADD, had relatively similar patterns of cocaine use. The subject with ADD had a total use similar to that of other subjects, but his intensity of use (.07 gms/hr.) was extremely low, less than half that of the next lowest subjects in the entire sample. That subject clearly used cocaine as self-medication and was one of the daily users. He used cocaine as appropriately as possible for an illicit substance, achieving desired improvement in attention and mood regulation without side effects or problems except for expense. He is described in detail elsewhere (Khantzian et al. 1984). Because this subject was so different from the remainder of our treatment population, he is excluded from the analyses of use patterns and diagnoses which follow.

The other subjects given additional axis 1 psychiatric diagnoses differed consistently from the rest of the sample. Their intensity of use was greater than that of subjects who did not meet additional diagnostic criteria (table 5), but they used less cocaine per week. As indicated in table 6, subjects without diagnoses used almost 70% more total cocaine weekly than those with diagnoses. Since the number of runs per week was similar for both groups, this reveals the most striking differentiating feature in our sample: runs in the group with effective diagnoses were far shorter, only half the duration of runs in the rest of the sample. An interaction between route of administration and diagnoses was examined and does not appear to account for this finding. These distinctions are consistent with clinical impressions of differences, discussed below, in the goals of cocaine intoxication for patients with additional psychiatric diagnoses. It should be noted that diagnoses were blind to usage since they were generated before the data were analyzed.

COMMENTS

Cocaine usage patterns observed in this treatment sample indicated that severe abuse occurred in discrete episodes of high intensity use. This was particularly so in i.v. users, where amounts of cocaine presumed to be extremely dangerous were self-administered routinely. Mean duration of administration was also different for different routes of administration.

A somewhat surprising but internally consistent constellation of findings in relation to diagnoses was also evident in this sample. These included the observation that the highest proportion of subjects with diagnoses were i.n. users and that subjects with diagnoses had low weekly cocaine use, but had very high intensity of use and short durations of use during episodes of cocaine abuse.

The cocaine use observed in this sample approximated past descriptions of runs with amphetamine and methamphetamine (Kramer et al. 1967), although the shorter acting cocaine also appeared to be associated with runs that were shorter in general than those described in previous amphetamine literature.

TABLE 5

Distribution of Intensity of Cocaine Use (gms/hour)
vs. Diagnosis

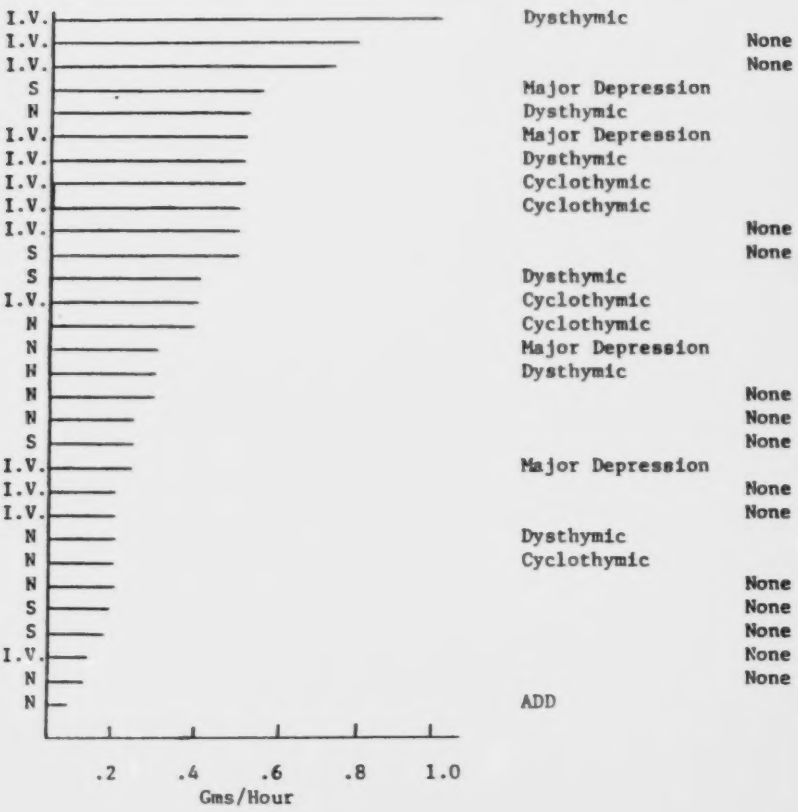

TABLE 6

Cocaine Abuse Pattern vs. Axis 1 Diagnosis
(numbers in parentheses indicate range,
other values are means)

	Cyclothymic	Major Depression/ Dysthymic	All Affective	No Extra Diagnosis
Use per week: (grams)	3.3 (1.2-6.0)	5.0 (1.5-9.0)	4.4 (1.2-9.0)	7.3 (1-20)
"Runs" per week:	1.2 (.7-2.0)	1.7 (.7-2.7)	1.5 (.7-2.7)	1.8 (.5-4.6)
Grams per week:	2.7 (1.0-3.5)	2.9 (1.3-9.6)	2.8 (1.0-9.6)	4.1 (1.1-7.8)
Duration of run: (hours)	7.3 (2.0-13.8)	7.2 (2.0-18.4)	7.3 (2.0-18.4)	13.0 (1.0-24.8)
Intensity of use: (grams/hours)	.39 (.15-.5)	.43 (.17-1.0)	.41 (.15-1.0)	.32 (.12-.8)

Past presumptions that "daily" cocaine use is tantamount to severe abuse may consequently require reassessment. Based on these data and our clinical experience, daily use of less than two-tenths of a gram of cocaine intranasally does not appear to represent severe abuse but may instead represent a potential stage that precedes the development of severely dysfunctional cocaine use which occurs in extended binges. It is only when the latter have occurred, at least in this sample, that users consider themselves unable to regulate cocaine use and sufficiently impaired to require treatment. Hence, particular factors, such as whether binges occur, how often they occur, how long they last, and how much cocaine is used, all need to be examined as possible determinants of both abuse severity and of treatment needs.

The assumption that decreased binge use occurs in recreational or controlled users who do not seek treatment requires naturalistic assessment. If our findings hold following such assessment, then the extent of cocaine binges, as well as the ability for controlled abstinence when indicated by psychosocial circumstances, may represent a basis to distinguish degrees of cocaine use severity. Finally, our assumption that early treatment effects did not substantially alter typical street abuse patterns also requires confirmation by naturalistic assessments.

Within the part of the spectrum of cocaine use occupied by abusers, there may be major differences in use patterns based on route of administration. In our sample, cocaine smoking involved greater use in longer runs, but was not as substantially different in intensity of use during runs, as early reports (Siegel 1982) had implied. We do not feel that the problems associated with freebase smoking have been overemphasized, but rather that problems of i.n. abuse have been underemphasized.

In addition, based on our sample, i.v. cocaine use remains prevalent in this era in use patterns of very high intensity. It has not been supplanted by cocaine freebase smoking. We do not think that the large boluses administered by i.v. users are inflated by low cocaine purity, since several of our i.v. subjects were involved in cocaine commerce high in the distribution hierarchy and have submitted samples of very high quality cocaine for analysis. Our impression, instead, is that subjects built up gradually to 1 gram i.v. boluses during their abuse history, beginning at 1/16 to 1/8 gram maximum boluses. Further, these users reported that they very seldom used amounts over .25 gram at the beginning of a run and started with doses of .05 grams early in their intravenous use. They then escalated to larger amounts 1.5 to 3 hours into a run. Combined with reports by some users that individual runs can conclude with as much as 1 gram of i.v. cocaine every 40 minutes for the last 40 hours, these clinical data indicate both that acute tolerance consistent with experimental evidence (Zahler et al. 1982) occurs during a binge and that chronic tolerance, reflected in increased initial doses, also occurs in street cocaine use. Further, lethal dosages in chronic abusers could far exceed amounts generally accepted as being lethal for the general population.

The diagnostic distinctions we observed are subject to current limitations in diagnostic validity in cocaine abuse. Followup studies in subjects who are drug free will be necessary before the validity of diagnoses such as those made here can be ascertained. Nonetheless, we believe the diagnoses reported are meaningful descriptors of clinical state and may have implications for treatment. Clear demarcation of distinct subsamples occurred for our population only along the dimensions of psychiatric diagnoses and route of administration. Subjects in this sample with diagnoses (i.e., those who displayed greater symptomatic impairment during the periods described above in the methods section) used somewhat less cocaine overall, but used it for far shorter time periods and less frequently than the rest of the sample, such that they actually used high quantities during the shorter periods that they self-administered cocaine. While this finding requires replication in larger samples, it is difficult to ignore.

We believe that until more data are available, a self-medication hypothesis best organizes these results on use patterns and diagnoses. Elsewhere we have described that abusers with psychiatric diagnoses have less substantial histories of cocaine use before

appearing for treatment than other abusers (Gawin and Kleber 1984b). When combined with the findings that such subjects used less cocaine and reported a larger proportion of i.n. rather than i.v. or freebase use, the conclusion is suggested that they experience increased psychic distress with less severe cocaine abuse. It is not clear whether they began with increased symptomatology or whether this reflects a greater sensitivity to the negative effects of cocaine. Further, these subjects described a goal of cocaine use that distinguishes them from the remainder of the sample. Our clinical impression is that other cocaine users seek a particular rewarding, euphoric state that they wish to maintain for prolonged periods and which is clearly an end in itself; while those with greater psychological distress use cocaine as an intermittent escape from chronic dysphoria, as a means towards returning to, and marginally tolerating, a persistently dysphoric existence. If so, alleviation of such dysphoria through appropriate social, psychological, and pharmacological interventions could have substantial impact in these subjects.

These impressions on goals of cocaine use are speculative. Their validation requires extensive and detailed research on large samples that is not easy to carry out. Consequently, they are likely to remain working hypotheses. In contrast, our finding that clinical characteristics differentiate subgroups of cocaine abusers is not speculative and is easier to test. This warrants replication and, if substantiated, further work on defining the extent as well as the clinical significance of differing clinical characteristics in cocaine abusers.

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Cocaine: Treatment Perspectives

Donald R. Wesson and David E. Smith

As with the use of any psychoactive drug, cocaine use is influenced by sociocultural factors: availability, legality, cost, beliefs about its safety or dangerousness, desirability, and status. Before the 1960s, when cocaine was primarily associated with heroin and the hard-core drug culture, cocaine users were generally regarded as criminals, and treatment of cocaine abusers occurred primarily in public drug treatment facilities.

But, in the late 1960s and 1970s, many people changed their attitude about cocaine use. This attitude shift occurred for many reasons. Most important was a general liberalization of attitudes about recreational drug use--a spinoff of wider acceptance of marijuana. Like marijuana, possession of cocaine was acknowledged to be illegal, but many people did not view its use as criminal. The media played a significant role in shaping attitudes. By publicizing and glamorizing the lifestyle of affluent, upper class drug dealers and the use of cocaine by celebrities and athletes, all forms of mass media created an effective advertising campaign for cocaine, and many people were taught to perceive cocaine as chic, exclusive, daring, and nonaddicting. In television specials about cocaine abuse, scientists talked about the intense euphoria produced by cocaine and the compulsive craving that people (and animals) develop for it. Thus, an image of cocaine as being extraordinarily powerful and a (therefore desirable) euphoriant was promoted. Since people don't really believe they will become "victims" (the same denial mechanism that allows people to smoke cigarettes), the addictive potential is not a deterrent. In fact, cocaine has many appealing attributes for the adventuresome: it is illegal, powerful, and dangerous. Its extravagant cost further serves to reinforce its elite and privileged status.

The issue of abuse potential has been confounded by professional and lay misunderstanding of the relationship between physical dependence and addiction. Models of addiction have used opiates as the prototype: addiction requires tolerance and physical dependence. Since cocaine has no obvious withdrawal syndrome in animals, it has been labeled nonaddicting. The notion that cocaine is not addicting because it does not induce physical dependence has been important in fostering widespread acceptance.

With cocaine's increasing social acceptance, the number of users increased among a diverse group of people--from professionals to street junkies. A national household survey of drug use conducted in 1982 showed that 28% of young adults, 18 to 25 years of age, had used cocaine on one or more occasions (Miller et al. 1983). The high morbidity that always occurs when a culture first incorporates a new intoxicant also occurred with cocaine.

Increase in frequency of cocaine abuse among drug addicts is being observed in both the public and private treatment sectors. Cocaine abuse is becoming increasingly conspicuous to private physicians because greater numbers of people are seeking treatment for complications of cocaine abuse, such as dependency and toxicity.

Although more people are coming to treatment for cocaine abuse (as well as attending cocaine support groups and Cocaine Anonymous), this does not necessarily reflect increasing prevalence of cocaine use in the total population. Some people use cocaine for several years before they develop dependency or medical complications from their use, and many people experiment with cocaine when it becomes fashionable among their peer group but quit without ever requiring medical attention. Many cocaine abusers now seeking treatment are mutiple drug abusers with cocaine being the pivotal drug bringing them to treatment.

Proprietary drug treatment programs have responded resourcefully to the emerging cocaine casualties of the affluent and medically insured, and they have devised treatment modalities specifically tailored to cocaine abuse: cocaine recovery support groups, resort retreats, aversive therapy, and short- and long-term residential treatment.

In spite of the availability of private treatment clinics and hospitals (many of which now advertise that they provide treatment for cocaine abuse), growing numbers of middle and upper class people are seeking treatment in alternative health care facilities, such as the Haight Ashbury Free Medical Clinic. These patients have a different profile than other patients treated at the Haight Ashbury clinic: most are white, employed, and have had no previous drug treatment. People may seek help in such clinics because they are fearful that treatment in hospitals (with billing for medical services to insurance policies which are often through their employer) will compromise their confidentiality. For the same reason, many cocaine abusers will not seek treatment from their private physicians or in a public drug treatment program.

The following case history illustrates many features common to cocaine addicts now being treated in private facilities:

> A 36-year-old male attorney from southern California sought treatment in a northern California chemical dependency recovery hospital for his cocaine abuse. He

had used cocaine for 2 1/2 years. Cocaine use was common among his attorney friends at parties, where it was typically available buffet style, put out in lines by the party host. After using cocaine several times at parties, the attorney began purchasing cocaine himself and using it when he was working alone at night in his office. Initially, he used cocaine sparingly and during periods of unusually high work loads. Cocaine allowed him to allay fatigue and facilitated his preparation of briefs and paperwork. He soon recognized that his recreational use of cocaine was not social-normative for his peer group. At parties where cocaine was available, he would often bring his own, which he would snort in the bathroom to supplement what the host would supply. (The usual custom among his friends was to use one or two lines at the party. To use more of the host's cocaine would be considered rude and "piggish.") His use of cocaine at his office became more frequent and, for the 6 months before treatment, daily. Although cocaine initially facilitated his capacity for work, as the dosage increased and use became regular, he accomplished less work and spent most of his nights at the office looking at pornography, masturbating, and snorting cocaine. As his addictive disease progressed, he worked less and spent most of his time obsessed with his next episode of use or recovering from his last binge. He began to drink heavily to get to sleep after heavy cocaine use and to medicate increasing agitation and irritability. During the 6 months before entering the hospital, he spent $36,000 of his personal business funds on cocaine. He knew the exact amount because he purchased his cocaine from another attorney and showed the cocaine purchases on his books as "professional consultations." His office associates, whose cocaine use was episodic, social-recreational and social-normative for their peer group, pressured him to seek treatment for his cocaine addiction before their practice suffered irreparable damage. They encouraged him to seek treatment in a program geographically distanced from their area of practice. At the time he entered treatment, he had a perforated nasal septum, had lost 40 pounds of weight, and his marriage was in serious trouble. He initially hoped that treatment could teach him controlled use of cocaine, i.e., he would be able to continue to use cocaine within socially acceptable limits like his friends. With 28 days of inpatient, recovery-oriented treatment, he eventually accepted the necessity of relinquishing all psychotropic drug use, actively participating in a recovery program and, after returning to practice, attending a cocaine recovery support group near his home.

COCAINE AVAILABILITY

Deception is the rule in the illicit drug marketplace, and pure cocaine is not generally available unless diverted from medicinal use. Illicit cocaine may be cut with lidocaine, tetracaine, mannitol, caffeine, and amphetamine; and the dosage of cocaine in street samples is highly variable. The toxicity of contaminants, cuts, and substitutes is one factor that must be considered in treating acute overdoses.

Since cocaine is available for medicinal uses through pharmaceutical suppliers, one might suppose that physicians who personally use cocaine for recreational purposes would acquire their supply of cocaine from pharmaceutical sources. Except for ear-nose-and-throat specialists and anesthesiologists, most physicians acquire cocaine for their personal use through the illicit marketplace because they are concerned that ordering cocaine would invite discovery of their drug use. Hospital pharmacists who work where large amounts of cocaine are used for surgery or for preparation of Brompton's solution (an oral pain-relieving medication for terminal cancer patients which contains a narcotic--usually methadone or morphine--in addition to cocaine and alcohol) have easier access to pure cocaine.

Cocaine Look-Alikes

Substances simulating the properties of cocaine (sold under names such as Peruvian Flake, Snocaine, and Hard Rock Crystal) are nationally advertised for mail-order purchase in "skin flick" and "biker" magazines. Cocaine look-alikes are also sold in drug paraphernalia shops. They may contain, alone or in combination, lidocaine, tetracaine, caffeine, or phenylpropanolamine. They are sold as incense and labeled with a reverse disclaimer, "not for drug use," in an effort to elude regulations applicable to drugs.

DIAGNOSIS OF COCAINE ABUSE

The third edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM III) states that a diagnostic category for cocaine dependence is not included because the withdrawal symptoms are transitory. Therefore, only a category of cocaine abuse is included. Cocaine abuse requires a pattern of pathological use (inability to reduce or stop use, intoxication throughout the day, and episodes of cocaine overdose), impairment of social or occupational functioning, and a duration of disturbance for more than 1 month.

PATTERNS OF COCAINE ABUSE

Most cocaine abusers do not use only cocaine. Cocaine abusers (particularly those using high dosages) usually use sedative-hypnotics (i.e., barbiturates, methaqualone, benzodiazepines, or alcohol) to self-medicate insomnia, agitation, and irritability. Thus, they develop an upper-downer syndrome similar to that associated with amphetamine use (Smith and Wesson 1973).

The simultaneous use of intoxicating amounts of stimulants and sedative-hypnotics can produce disastrous consequences. The intoxicated individual has the gross impairment of judgment and motor skills produced by the sedative-hypnotic and has the energy to remain awake and active due to the stimulant.

The use of alcohol or other depressants to relieve cocaine's side effects can result in a secondary dependence on sedatives. People with combined alcohol dependence and cocaine abuse often seek treatment in alcohol treatment centers where they may encounter inadequate information about treatment of cocaine abuse and ambivalent attitudes toward treatment of mixed drug and alcohol addiction. Dual dependence on cocaine-alcohol or cocaine-opiate combinations increases the severity of withdrawal.

Instead of, or in addition to, sedatives, some high-dose cocaine abusers also medicate the side effects of cocaine with narcotics such as heroin and meperidine (Demerol) or other prescription drugs.

Cocaine Freebase

The cocaine alkaloid is known as freebase. It volatilizes at a low temperature, and the user inhales the vapor. Smoking of cocaine freebase in the United States was predated by the smoking of coca paste in Peru (Jeri et al. 1978). Cocaine freebase use is associated in the San Francisco Bay area with a parallel increase in the smoking of Persian heroin (Inaba et al. 1980). Initially, cocaine users smoke Persian heroin to reduce the agitation produced by cocaine. However, as a consequence of using heroin, they may acquire narcotic hunger and a desire for heroin--thereby evolving into primary heroin abusers or mixed heroin and cocaine abusers. Many freebase users are middle class, have no previous experience with the drug treatment system, and have short addiction histories. Because many of these people believe that "if you don't stick a needle in your arm, you can't be a cocaine or heroin addict," they often present for treatment unaware of their physical dependence.

Most cocaine freebase users prepare their own freebase from cocaine hydrochloride, although recently cocaine freebase called "rock" has found a market in Los Angeles and Oakland, California.

Intravenous Injection of Cocaine

Cocaine hydrochloride can be dissolved and injected. Some cocaine abusers figure out that the injection mode is a more efficient way of using a limited drug supply. Although cocaine may be the first drug ever injected, intravenous cocaine abusers are usually already familiar with injection because they are also heroin users. When heroin and cocaine (or heroin and amphetamine) are injected simultaneously, it is called "speedballing." The risk for acute overdose reactions increases with speedballing, either because of the stimulant effect or the depressant effect.

COMPLICATIONS OF COCAINE USE

Cocaine alone and in combination with other drugs can produce many serious medical and psychiatric complications. The cardiac consequences of cocaine use include tachycardia, hypertension, and ventricular arrhythmias. Coleman et al. (1982) reported a case of myocardial infarction associated with snorting cocaine in a 38-year-old male.

In most fatal cocaine overdoses, the mechanism of death appears to be respiratory arrest or cardiac arrhythmia. Although most fatalities have occurred among those who injected cocaine or smoked it in its freebase form, deaths also occur with cocaine snorting. Deaths from body-packing (a practice whereby cocaine smugglers conceal the drug in their stomach or intestinal tract) also have occurred when the storage containers burst and the smuggler's body receives a massive amount of cocaine (Wetli and Mittleman 1981).

An acute massive overdose of cocaine can produce seizures. Intravenous diazepam and support of the cardiorespiratory system for status epilepticus or postseizure depression are the appropriate techniques for management of the cocaine-induced seizure. Beta-blockers such as propranolol are appropriate pharmacological treatment for cocaine-induced hypertensive crisis and other cardiovascular dysfunctions, as well as the acute anxiety reactions linked with the hyperadrenergic storm associated with cocaine abuse (Gay 1981).

Cocaine can produce a broad range of psychological effects, ranging from acute anxiety to full-blown cocaine psychosis with paranoia, and auditory and visual hallucinations. These toxic reactions are dose related and depend on physical tolerance to the drug, psychological set, and sociocultural setting. Acute anxiety reaction or the "overamp" described by the cocaine abusers usually can be managed in an outpatient setting with reassurance, a supportive environment, and oral sedative-hypnotic medications such as diazepam.

As with amphetamine, high-dose, prolonged administration of cocaine in the dosage range of 1 to 4 grams a day is associated with sleep deprivation and cocaine psychosis--with auditory and visual hallucinations, paranoia, and ideas of reference. We have seen a substantial increase in cocaine psychosis at the Haight Ashbury Free Medical Clinic due to abuse of cocaine freebase.

Qualitatively, the cocaine psychosis is similar to the amphetamine psychosis but shorter in duration. With a structured outpatient setting, we have been able to manage these cocaine psychoses with the use of haloperidol (Haldol), 2 mg every 4 hours. If this regimen does not control paranoia and other psychotic symptoms, psychiatric hospitalization and higher dosages of haloperidol are indicated.

Combined Psychiatric Disorders and Cocaine Abuse

Occasionally, an individual with an underlying thought disorder has a cocaine-precipitated, more prolonged psychotic reaction. Often there is a family history of schizophrenia, and the prolonged psychosis probably is cocaine precipitated. These cases are also frequently complicated by multiple drug abuse.

In our experience with cocaine abusers, over 90% who have cocaine abuse as the primary addictive disease do not have underlying major psychopathology. A few patients had a primary depressive disorder which predated cocaine abuse. Most of these patients also had a family history of affective disorders or schizophrenia. For that minority with major underlying psychopathology, such as endogenous depression, the treatment of choice is usually tricyclic antidepressants (e.g., imipramine and desipramine) in association with problem-oriented counseling.

Sexual Dysfunction

Cocaine affects sexual functioning similarly to amphetamine. At low doses, cocaine enhances sexual desire and is highly rated as an aphrodisiac in the drug culture, especially by males. However, as the dosage increases and use becomes chronic, particularly if the route of administration is freebase smoking or injection, a male may experience impairment of ejaculatory and erectile ability. Women have difficulty achieving orgasm. An ethnographic study of cocaine uses by masseuses found that males valued cocaine because of delayed ejaculation, but often erectile performance was so impaired that erection would not occur (Wesson 1982). Since cocaine-induced sexual dysfunction is one motivation for seeking treatment, awareness of sexual dysfunction is important for treatment personnel (Smith et al. 1984).

High doses of cocaine, like high doses of amphetamine, also can facilitate sexual behavior that the individual self-defines as aberrant and unhealthy, e.g., compulsive masturbation or multi-partner marathons.

Dependency

Although the issue of physical dependence on cocaine is still controversial--especially among animal pharmacologists--experienced clinicians have observed two types of reactions which are probably withdrawal reactions: (1) following a short high-dose binge of cocaine use, there is a 2- to 4-day period in which the person is apathetically depressed, fatigued, and exhausted; and (2) following chronic high-dose use of cocaine, the withdrawal period is characterized by an agitated depression, lethargy, insomnia, and irritability.

In open label studies, we find L-tryptophan, the amino acid precursor to serotonin, in dosages of 2,000 mg to 6,000 mg per day, effective in reducing a patient's anxiety, agitation, and insomnia

associated with stimulant withdrawal. We do not employ tricyclic antidepressants for treatment of cocaine withdrawal depression unless there is clear evidence for a depressive disorder unrelated to cocaine use.

Addiction

We define addiction as compulsion to use the drug, loss of control over the amount used, and continued use in spite of adverse consequences. Using this definition, cocaine is unquestionably addicting. The cocaine patients we have treated used cocaine compulsively; and during a use episode only cocaine availability or development of legal, medical, or psychiatric complications limited use. They continued to use despite compromise of their personal or business financial resources, negative impact on marriages and families, and compromise of their work capacity or employment. Even within the structure of an outpatient recovery program, many cocaine abusers have great difficulty remaining cocaine free.

MANAGEMENT OF COCAINE DEPENDENCE

If a DSM-III diagnosis of cocaine abuse can be made, it is important to establish complete abstinence from all psychotropic drugs as the treatment goal. Many cocaine addicts hope to establish controlled use of cocaine or are reluctant to relinquish use of alcohol or other psychotropic drugs which have not resulted in addictive behavior. In patients who repeatedly become toxic with cocaine and are unable to resist cocaine hunger, the greatest single reason they relapse is the belief that they can return to controlled use of cocaine. Like other addictive diseases, once the line into compulsive use has been crossed, even if that compulsive use is episodic, the person has lost the ability to return to controlled use.

Recovery

For the majority of cocaine abusers, the focus of treatment is the toxic consequences of cocaine, with cocaine-free recovery as the goal of treatment. This is best accomplished through a combination of individual and group therapy. If the cocaine abuser is unable to maintain abstinence as an outpatient, a period of inpatient treatment is necessary. Principles of recovery and constructive alternatives as a way of dealing with cocaine hunger are stressed. A positive approach to recovery, in contrast to "white knuckle sobriety," is fostered. The recovery process requires substantial education of the client on addictive disease generally and on cocaine abuse specifically. Active allies also are required for this process to succeed, including family members whenever possible. Many times, recovery is enhanced by family therapy.

Group therapy is a vital component of the recovery program. There are many types of groups which may be useful: cocaine recovery support groups, Cocaine Anonymous, and psychotherapy groups.

Cocaine recovery support groups, in which previous cocaine abusers support one another in maintaining abstinence, have proven effective for many patients. The cocaine recovery groups are composed of patients who are in different stages of recovery: some recently abstinent and some who have a year or more of abstinence. The mix of patients in early recovery with those who have substantial periods of abstinence is important. Early in recovery, the recovering cocaine abuser may not <u>really believe</u> that long-term abstinence is possible. Having people with long periods of abstinence in the group reinforces the possibility of continued abstinence, and people with long-term abstinence usually lend support to the notion that cocaine hunger becomes less frequent and less intense the longer one is abstinent.

Cocaine Anonymous is another group model which is helpful for many cocaine abusers. As it is not as widely available as Alcoholics Anonymous (A.A.) or Narcotics Anonymous (N.A.), some cocaine abusers also attend A.A. and N.A. to maintain their recovery. Since cocaine abusers may abuse other drugs, particularly alcohol, participation in A.A. and N.A. groups may be especially desirable.

Other important aspects of recovery may include an exercise program in which the person uses exercise not only to improve general health, but also to deal with cocaine hunger. Exercise that produces cardiopulmonary stimulation for more than 20 minutes can produce an increase in the release of endogenous endorphins followed by a reduction in drug hunger and anxiety. We regularly use the exercise alternative as part of the cocaine recovery program to reduce cocaine hunger and enhance self-image.

It is important to emphasize that the patient's recovery program is a positive health and image-enhancing process aimed at making the individual cocaine-free. Attempts to return to controlled use must be defined as a slip or a relapse. During the recovery period, anticipatory guidance should be given to the patient regarding handling of cocaine dreams, cocaine drug hunger, and addictive thinking. Relapse does not usually happen as a single, isolated event. The relapse to use is almost always preceded by a period of "addictive thinking." The patient begins to view himself or herself as "cured" and no longer in need of constant vigilance and peer support. The patient begins to believe that the need to maintain abstinence from <u>all</u> psychotropic drugs is no longer necessary. Sooner or later, the person will try cocaine once to "test" his ability to control use. If loss of control is not immediate, the notion of the "cure" is reinforced, and the person is further estranged from recovery support peers who will challenge the developing "addictive thinking."

Silence is the enemy of recovery. Open discussion supplemented with positive alternatives is necessary to interrupt this sequence

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and thereby prevent first use and relapse. The term "cure" in the sense that the person can return to controlled cocaine use has no place in an effective recovery program. Instead, it is important to stress that recovery--meaning no psychoactive drug use and active participation in relapse prevention through peer support--is not only possible, it is a positive, life-enhancing process.

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New Patterns of Cocaine Use: Changing Doses and Routes

Ronald K. Siegel

INTRODUCTION

During the twilight hours of the 19th century, Chicago socialite Annie C. Meyers took a scissors and pried loose one of her gold teeth. With blood streaming down her face and drenching her clothes, she pawned the tooth for 80 cents; the money was needed for her daily purchase of "Birney's Catarrh Remedy," an over-the-counter cocaine snuff. After 8 years in a self-described "cocaine hell," Meyers was successfully treated and became the first cocaine abuser and first woman in the world to write a drug confession (Meyers 1902).

The experiences of Annie Meyers marked a turning-point in the use of cocaine and illustrated how abuse of cocaine, even when it was inexpensive and legal, could produce effects and behaviors uncannily similar to contemporary headlines. For example, Meyers became a thief and forger to support her 10-dollar-a-day habit, although a month's supply of preparations like "Coca Smoke Ball" and "Coca Bola" chewing paste was only 50 cents (Ashley 1975). Indeed, the first recorded purchase of a cocaine product in the United States was for a 50-cent bottle in 1860. The time of that purchase, 5 years after the alkaloid was isolated from coca by Gaedecke and 1 year after Albert Nieman named it "cocaine," signaled the start of new preparations, doses, and routes of cocaine use. Prior to this time, only coca products were available and the patterns of their use had not changed substantially in over 4,700 years.

Historically, South American natives administered coca orally, topically, and via smoking with low, albeit effective, dosages. When used orally, the leaves were chewed, sucked, and swallowed. Studies on contemporary coca chewers suggest that this pattern of administration results in an average daily ingestion of 200 mg to 500 mg of cocaine, with plasma cocaine levels similar to those achieved from intranasal (i.n.) administration (Holmstedt et al. 1979; Paly et al. 1980). Quids of partially chewed leaves were used as local anesthetics for trephining operations (Hrdlicka 1939) and to relieve posttrephining distress (Moodie 1923). The juice of chewed leaves is still used to treat eye and throat

irritations (Grinspoon and Bakalar 1976) and the dosages necessary for effective local anesthesia could be as low as just a few milligrams (Martindale 1982). The sacrificial burning and smoking of coca leaves and seeds for magico-religious practices, both past and present, as well as for the relief of upper respiratory problems probably delivered less than 25 mg of cocaine (Siegel 1982).

ORIGINS OF CONTEMPORARY ABUSE: PROMOTION OF MEDICAL MYTHS

Coca was introduced to Europe in reports by 16th century explorers, 17th century chroniclers, 18th century naturalists, and 19th century botanists (Mortimer 1901). After Mantegazza's 1857 and 1859 essays on the virtues of coca, medical and nonmedical coca products appeared and use initially followed the same low dose patterns observed in South America. The first coca wines and tonics were introduced in France in the 1860s and, eventually, were advertised throughout the rest of the world. These promotions, lacking medical or scientific proof, encouraged changing patterns and increased dosages that inevitably led to abuse. Recent analysis of these historical patterns and dosages, heretofore ignored by most contemporary studies, reveals that historical use, often glorified and celebrated, was inextricably tied to abuse.

An analysis of representative pharmaceutical bottles and formulas in the author's collection has revealed that these tonics and extracts contained approximately 3 mg to 160 mg of cocaine per dosage unit. The coca wines and related alcoholic beverages contained approximately 35 mg to 70 mg of cocaine per dosage unit (glass). Some, like Vin Mariani, were concentrations of two ounces of leaves in 18-ounce bottles of wine. The coca leaves themselves were not standardized for cocaine content and may have varied from less than .01% to 1.5% cocaine (Hanna 1970; Novak et al. 1984; Plowman and Rivier 1983; Rivier 1981). The leaves used in manufacturing wines and tonics averaged .65% a concentration remarkably similar to assays of contemporary cultivated coca leaves (Coca wines 1886; Plowman and Rivier 1983; Rusby 1888). Mariani's Elixir was three times more concentrated than the wine, and his coca tea was eight times more concentrated (Mariani 1888, 1892). Nonetheless, recommended doses of these preparations would have resulted in daily ingestion of little more than 450 mg of cocaine. Most wines available in the 1890s contained approximately 10 mg of cocaine per fluid ounce and recommended doses were from one-half a wine glass (2 oz. or 20 mg) to a full wine glass (4 oz. or 40 mg) per administration (Coca wines 1886). French Wine Coca, the original name for Coca-Cola, was an imitation of these French coca wines and reportedly contained less than one-half ounce of coca leaves per gallon.[1]

Initially, physicians, pharmacists, and chemists recommended a pattern of use for drinking coca products that would have resulted in less daily intake of cocaine than from chewing the leaves, but with the same stimulating properties. For example, in the first commercial book advertising coca and its products,[2] Chevrier

(1868) claimed a wide variety of therapeutic applications for coca preparations which were equal to the chewed leaves but did not have to be used as often. Indeed, most coca fluid extracts and wines, the most popular preparations recommended by physicians (Mortimer 1901), were formulated on the basis of their equivalence in leaves.

The second book on the subject, Erythroxylon Coca: A Treatise on Brain Exhaustion as the Cause of Disease by British physician William Tibbles (1877), recommended use of coca for a variety of physical and mental diseases. The third book, La Coca du Perou, was the first in a long series of publications by chemist Angelo Mariani (1878) which expanded the therapeutic applications of his many coca products. The fourth book, published by New York physician W.S. Searle (1881), endorsed medical use for all problems of life and as an alternative to tobacco, tea, coffee, and wine. The coca dosage regimes recommended by Tibbles, Searle, and their colleagues would have resulted in daily ingestion of no more than 65 mg to 160 mg of cocaine. Coca-Cola, promoted as a "Brain Tonic" for exhaustion, went through several changes in its formulas (Louis and Yazijian 1980) and, from the 1890s to 1903, contained approximately 60 mg of cocaine per 8-ounce serving. By the time the fifth book on coca was published (Thudichum 1885), it was an accepted medical fact that coca, and its alkaloid cocaine, represented the power to relieve suffering.

Concomitant with the escalation of new coca products on the market, advertisements promoted their use for a wide variety of nonmedical purposes. The following example of a coca advertisement illustrates this change in pattern of use:

> Public Speakers, Singers, and Actors have found wine of coca to be a valuable tonic to the vocal cords. Athletes, Pedestrians, and Base Ball Players have found by practical experience that a steady course of coca taken both before and after any trial of strength or endurance will impart energy to every movement, and prevent fatigue. Elderly people have found it a reliable aphrodisiac superior to any other drug. (Metcalf's Wine of Coca)

However, cocaine itself was widely available at this time and the dosage regimes recommended for use of cocaine products by Tibbles, Merck (1885), and Martindale (1886) would have resulted in daily ingestion of as much as 810 mg to 1,620 mg of cocaine, or approximately three times the cocaine intake of the coca chewer. Indeed, whereas coca products and dosages were treated as roughly equivalent to the chewing of coca leaves, cocaine was advertised as 200 times stronger than coca, one grain of cocaine being the equivalent of 200 grains of coca leaves (Hammond 1887).

But little adjustment for this dose consideration was made. In fact, the convenience of cocaine prompted even the most conservative of physicians to apply its use to virtually all medical and

nonmedical complaints. Using the typical medical hyperbole of the times, Tibbles promoted a cocaine "Child Restorer" as a universal remedy for diseases of children, a "Brain Feeder" in all cases where an individual desired more energy, and a "Compound Essence of Cocaine":

> This is a preparation containing all the Principles of Coca-leaf....It thoroughly invigorates the Brain, Nerves, and Muscles, re-energizes the failing functions of Life, and thus imparts energy and vitality to the exhausted nerve-force, and rapidly cures every form of nervous exhaustion, from whatever cause.

Cocaine became available in a wide variety of base and salt preparations, some in combination with other agents including agonists like atropine and physostigmine and narcotic-analgesics like morphine. The increased use of cocaine was further complicated by the increasing popularity of the highly efficient intranasal and injection routes of administration. Inhalant and intranasal doses of 65 mg were commonly used and injection doses as high as 32 mg to 1,200 mg were employed. Some asthma and hay fever snuffs were pure cocaine and users were instructed to take them as needed (Ashley 1975). Recommended doses via smoking of coca cigarettes and cigars could have been as high as 225 mg per day (Parke, Davis & Co. 1885). By 1894, cocaine was being used topically on the penis as well as rectally and vaginally (Martindale 1894).

It is not surprising that widespread availability of cocaine marked the decline of coca as a medicine. But the parallel increases in cocaine dosages, routes of administration, and medical and nonmedical abuses just as quickly arrested cocaine's development as a therapeutic agent. Daily dosages of cocaine "addicts" sometimes reached over 12 grams (Meyers 1902), doses almost impossible to achieve with coca products and ones that would not be seen again until the discovery of smoking cocaine freebase. Changes in legislation and medical practices effectively prevented any further changes in patterns of cocaine use until a century after the first bottles were purchased.

CONTEMPORARY PATTERNS: 1970-78

The first contemporary book on cocaine appeared in 1972 (Chasin 1972) and marked a resurgence in nonmedical cocaine use. The book noted that 90% of users preferred i.n. administration, a pattern of use illustrated in several motion pictures released that same year (Go Ask Alice, Dealing, Superfly, and The Discreet Charm of the Bourgeoisie). In those movies, use was portrayed as discreet, involving small i.n. hits from spoons or straws; charming, in terms of the perception users had of their use; and, bourgeois, finding its way into middle class lives. These patterns were not inventions of screenwriters but simply reflections of contemporary patterns of use at that time (Starks 1982).

The cocaine paraphernalia industry was just developing (Wynne et al. 1980), and spoons and straws for i.n. cocaine use became popular. Siegel (1977) determined that the average cocaine spoon available at that time delivered 5 mg to 10 mg of pure cocaine. The average amount of cocaine delivered through a straw from a "line" was 25 mg. Since two cocaine spoons or two lines (one for each nostril) were used, each administration consisted of 20 mg to 50 mg.

During the period 1970 to 1978, studies reported various patterns of use ranging from experimental use of a few lines or "hits" of cocaine to daily compulsive use of 4 grams (Siegel 1984a). Five patterns of nonmedical cocaine use have been defined by Siegel (1977) and these will be used for discussion here.

Experimental Use

Experimental use was defined as short-term, nonpatterned trials of cocaine with varying intensity and with a maximum lifetime frequency of 10 times (or a total intake of less than 1 gram). These users were primarily motivated by curiosity about cocaine and a desire to experience the anticipated drug effects of euphoria, stimulation, and enhanced sexual motivation. Experimental use was generally social and among close friends but did not continue due to a multiplicity of reasons, including economic and supply considerations, disappointment with the intensity and duration of the drug effect, and fear of legal penalties, among others.

Social-Recreational Use

The most common pattern was social-recreational, whereby use generally occurred in social settings among friends or acquaintances who wished to share an experience perceived by them an acceptable and pleasurable. Such use was primarily motivated by social factors and did not tend to escalate to more individually oriented patterns of use. Use tended to occur in weekly or biweekly episodes and continued primarily for three reasons: (1) cocaine was viewed as a social drug which facilitated social behavior; (2) cocaine was viewed as "ideal" and "safe" in terms of convenience of use, minimal bulk, rapid onset, minimal duration, and few side effects and after effects; and (3) cocaine was viewed as appealing in terms of sociocultural images.

Circumstantial-Situational Use

Circumstantial-situational use was defined as a task-specific, self-limited use which was variably patterned, differing in frequency, intensity, and duration. This use was motivated by a perceived need or desire to achieve a known and anticipated drug effect deemed desirable to cope with a specific condition or situation. Use tended to occur in four or five episodes per week. Motivation cited by users included the enhancement of performance or mood at work and play.

Intensified Use

Intensified use was defined as long-term patterned use at least once a day. Such use was motivated chiefly by a perceived need to achieve relief from a persistent problem or stressful situation or a desire to maintain a certain self-prescribed level of performance.

Compulsive Use

Compulsive use was defined as high-frequency and high-intensity levels of relatively long duration, producing some degree of psychological dependency. The dependence is such that the individual user cannot discontinue such use without experiencing physiological discomfort or psychological disruption. The compulsive patterns are usually associated with preoccupation with cocaine-seeking and cocaine-using behavior to the relative exclusion of other behaviors. The motivation to continue compulsive levels of use was primarily related to a need to elicit the euphoria and stimulation of cocaine in the wake of increasing tolerance and incipient withdrawallike effects.

THE SOCIAL-RECREATIONAL USER: 1970-78

The most common pattern of cocaine use during the contemporary period of 1970 to 1978 was the social-recreational pattern. The average social-recreational user studied by Siegel (1977) used 1 to 4 grams of cocaine per month. However, doses were not evenly distributed over time. Users generally purchased cocaine in half-gram or gram quantities and most consumed it within 2 to 7 days. During days of use, users would average daily intakes of 150 mg.

In 1974, a group of 99 such social-recreational users were recruited for a longitudinal study (Siegel 1977, 1980a, 1984a). These users were selected through advertisements distributed to several million households by Los Angeles newspapers. While the sample represents a specific geographical population, the users appear highly similar to those sampled by smaller studies elsewhere (Grinspoon and Bakalar 1976; Resnick and Schuyten-Resnick 1976). In addition, while only 50 of these users (50%) continued through the 9 years of the study, their changing patterns and effects were similar to those found during this period in both short-term and longitudinal studies involving smaller numbers of users (Ashley 1975; Spotts and Shontz 1976, 1980). Indeed, Spotts and Shontz (1980) have claimed that the intensive study of even a small number of representative cases is a powerful tool in studying drug abuse. The subjects in this study also represent the only cocaine users that have been intensively studied for most of a decade, a decade which marked significant changes in patterns of cocaine abuse.

While the patterns of use changed considerably over the 9 years of the study, initial use during the first 4 years of study (1975-78)

appeared relatively stable. During that period, all subjects remained social-recreational users but 75% engaged in episodes of more frequent use. These latter episodes included circumstantial-situational and intensified patterns, but always the subjects returned to social-recreational use as their primary pattern. None of the users engaged in compulsive use during this period.

However, most social-recreational users also manifested a potentially toxic pattern of use which can be called "binge" use. Binge use, also known as "runs," refers to a continuous period of repeated dosing, usually at least once every 15 to 30 minutes, during which users consume substantial amounts of cocaine. During binges, users may assume some of the behavioral characteristics of compulsive users. Binge use appears to be motivated by a desire to maximize positive drug effects. While binging can be found within all groups of cocaine users, social-recreational users did not tend to binge during the period 1975 to 1978. When engaged in episodes of intensified use, 17 users reported binges which involved intake of an average of one-half a gram (range 0.25 to 1.25 grams) in runs averaging 4 hours (range 1 to 18 hours).

Nonetheless, for a proportion of users the social-recreational patterns appeared relatively stable. Several variables, including the following, contributed to this stability. Firstly, the purity of street cocaine remained relatively the same during this period with an average of 53% (range 43.2% to 60.8%). Secondly, these users continued to purchase cocaine in half-gram or gram quantities for prices which averaged $75 to $100 per gram. Thirdly, the size and nature of the cocaine spoons and other paraphernalia remained relatively the same. Fourthly, the i.n. route remained the most common. Users experiencing nasal problems practiced various methods of nasal hygiene described by consumer handbooks with the aid of nasal douches and other devices offered by the paraphernalia industry. Fifthly, the misperception of i.n. cocaine as a "relatively safe and ideal social-recreational drug" was common among users (Siegel 1977). Sixthly, physical and psychological problems were rarely encountered by social users, and treatment of cocaine effects with combinations of other drugs such as diazepam or methaqualone was reported by only 4% of these users.

CONTEMPORARY PATTERNS: 1978-82

The image of widespread patterns of cocaine use was reflected in the films of the later 1970s. Cocaine was something to joke about in Annie Hall (1977), something to flaunt in the faces of the police in The Rubber Gun (1977), something for young single women to do in Looking for Mr. Goodbar (1977), something for sexual stimulation in Sensations (1977) and Sharkey's Machine (1981), something for entertaining your neighbors with in Cocaine Cowboys (1978), for young women to snort in Pretty Baby (1978) and Wolfen (1981), and for old men to peddle in Atlantic City (1981).

The patterns of use among continuing users began to change (Siegel 1982, 1984a) during this period, mirroring the expanded use in the cinema. The users in Siegel's longitudinal study (Siegel 1984a) averaged between 1 and 3 grams per week from 1978 to 1983. Fifty percent (n=25) of the users still in the study (N=50) remained social-recreational (with continuing episodes of increased use) while 32% (n=16) of the users became primarily circumstantial-situational users, 8% (n=4) became intensified users, and 10% (n=5) became compulsive users.

Dosages varied with pattern of use. The social-recreational users averaged approximately 1 gram per week, circumstantial-situation users averaged 2 grams per week, and intensified users averaged 3 grams per week. Most users engaged in some binge use characterized by the same doses and durations observed during the period 1975 to 1978.

Perhaps the most dramatic change was seen in the compulsive pattern of use. While compulsive i.n. use has been described in other studies (Ashley 1975; Resnick and Schuyten-Resnick 1976), compulsive users here were all smokers of cocaine freebase. Accordingly, they averaged 1.5 grams per day (range 1.0 to 30.0 grams). The nature and consequences of this pattern of use have been discussed elsewhere (Siegel 1982). Most if not all compulsive use here occurred in binges involving intake of 1.5 grams (range 0.25 to 30.0 grams) in a 24-hour period (range 1 to 96 hours).

Taken together, the period 1978 through 1982 marked an escalation in dosages and dose regimes for these social-recreational users. Changes in several variables were associated with this change in pattern of use. Firstly, the purity of street cocaine declined during this period to an average of 29.2% (range 13.9% to 48.7%). Secondly, users tended to purchase cocaine in full gram or one-eighth ounce (3.5 grams) quantities and the half-gram unit became increasingly scarce. Thirdly, the paraphernalia industry introduced a variety of cocaine dispensing devices, known collectively as "bullets," which delivered an average hit of 25 mg (range 15 to 50 mg), more than twice the hit from a cocaine spoon. The average size of commercial cocaine spoons themselves actually got smaller (average 8.3 mg, range 5.0 to 24.1 mg). The paraphernalia industry also introduced a wide variety of cocaine smoking kits and accessories (Siegel 1982). Fourthly, the smoking route became a preferred route of administration for many new users. Fifthly, the perception of i.n. cocaine as a relatively safe pattern of drug use continued in the face of increasing negative publicity concerning cocaine smoking (Siegel 1982). And sixthly, users increased multiple drug use in their self-treatment of cocaine- related problems. Fully 30% of Siegel's respondents were using methaqualone and 13% were using diazepam.

CONTEMPORARY PATTERNS: 1982-84

Movies with cocaine-related themes began reflecting changing patterns of use in 1982. In his concert film Richard Pryor Live on Sunset Strip (1982), comedian Pryor related the tragedy of his near-death experience in a cocaine smoking accident. Cocaine-related personality changes were the subject of films like Jekyll & Hyde...Together Again (1982). And cocaine-related disruption of families and marriages was woven into films such as Cocaine: One Man's Seduction (1983) and Torchlight (1984). Finally, and most dramatically, the violence of cocaine-related activities was the subject of Mike's Murder (1983), Scarface (1983), and Against All Odds (1984).

Parallel changes were seen in the patterns of cocaine users off the screen. Numerous studies noted a dramatic increase in physical and psychological problems associated with cocaine dependency and toxicity, and these have been discussed elsewhere (Siegel 1984a).

A new pattern of i.n. cocaine characterized by concentrated "binge" use emerged among both continuing users and new users. This pattern involves the use of an entire week's supply of cocaine during a single episode or binge or run ranging from 4 to 48 hours. Continuing users in Siegel's longitudinal study still averaged 1 to 3 grams during these binges. But other users interviewed by the author reported using between 0.5 grams and 7.0 grams during these binges.

In addition to more concentrated dose regimes, dosages themselves became more concentrated. The average purity of street cocaine during 1982 to 1984 for these users was determined to be 73.3% (range 58% to 87%). This change was undoubtedly influenced by worldwide increases in coca and cocaine production coupled with decreased availability of cocaine substitutes, adulterants, and diluents due to paraphernalia legislation (Smith 1982; Drug Paraphernalia Litigation 1984). Concomitantly, the price dropped to pre-1977 levels of $60 to $100 per gram, with an average price of $85 per gram. The decreased availability of paraphernalia also prevented the precise control over individual doses afforded by the cocaine spoons and dispensers, and this often resulted in intake of large amounts.

Many users reported that quantities of cocaine would be purchased for use during specific episodes or binges that would terminate only when supplies were exhausted. In Los Angeles, young users (12 to 17 years of age) reported the availability of small quantities for purchase at clubs and schools. These quantities included single doses selling for $10 and one-eighth grams selling for $25.

The decline of the paraphernalia industry has also resulted in a shortage of cocaine-smoking accessories. Thus, the most common method of preparing cocaine freebase is now the baking soda

method (Siegel 1982) whereby the need for special chemicals and glassware is eliminated. The reduced supply of cocaine pipes has resulted in an increase in smoking cocaine freebase in combination with tobacco. The increase in importation of coca paste into the United States has already led to reports of coca paste smoking, and these reports are discussed below.

During the period 1982 to 1984, users reported a wide variety of experimental patterns in order to avoid rhinitis and other problems of i.n. cocaine use and also to avoid the dependency and toxicity associated with cocaine smoking. Some users have reported experimenting and maintaining regular use of cocaine hydrochloride vaginally, rectally, and sublingually. Others have adopted a regular pattern of smoking cocaine hydrochloride (Siegel 1982). Still others have employed regular use of subcutaneous injections of cocaine hydrochloride. A few users have employed the i.n. route of administration for cocaine freebase and some are smoking coca paste.

Two of these patterns, i.n. cocaine freebase and coca paste smoking, represent the newest methods to appear in the United States and they are discussed below.

An important caveat is that these methods have only appeared in a few communities and the number of users appears relatively small. However, it is also important to note that more widespread practices, like the smoking of cocaine freebase, were initially detected among a small number of users in these same communities, areas that lie within trafficking corridors. Like those initial smokers of cocaine freebase, most coca paste smokers are individuals from the producing or trafficking countries that service these corridors.

INTRANASAL COCAINE FREEBASE

Cocaine freebase is only slightly soluble in water (1 in 600 of water) as compared to the high solubility of cocaine hydrochloride (1 in 0.5 of water). Thus, when used i.n., cocaine freebase has a slow absorption in mucous membranes, resulting in a slow onset of effects but a sustained duration of action. Clinically, this property has been utilized to obtain a prolonged therapeutic effect in ointments, oily solutions, and topical preparations. Intranasal cocaine freebase was first developed as an experimental treatment for rheumatoid arthritis (Bingham 1980). Patients were treated with a maximum of 600 mg per day (Bingham and Somers 1981) and this experimental program received considerable publicity throughout California in the period 1982 to 1984. Most users from the following study learned of this new route of administration from the program publicity, while others reportedly "invented" the technique themselves.

The Sample

A small group of i.n. cocaine freebase users were recruited from cocaine treatment centers, through word-of-mouth advertisements, and from a previously studied population of cocaine smokers (Siegel 1982). Users were initially screened by a telephone interview and a subsequent drug-history questionnaire. While 175 users reported past or present experimental use, most users mixed i.n. cocaine freebase with other methods of cocaine administration. Twelve users, seven male and five female, were eventually selected for representative case study by meeting the requirement of exclusive i.n. cocaine freebase use for at least 2 months. The subjects ranged in age from 25 to 69 and were examined and tested in a private office. Examination procedures included both physical and psychological tests described elsewhere (Siegel 1977).

Preparation and Purity

Subjects prepared cocaine freebase from cocaine hydrochloride using a variety of extraction procedures (Siegel 1982). The most preferred procedure was the sodium bicarbonate/water method because it was infrequently associated with nasal complaints. This procedure can effectively convert at least 56% of the existing cocaine hydrochloride to its freebase while removing some, but not all, adulterants and diluents (Hisayasu et al. 1982, procedure 5). Other procedures can convert 96% of the cocaine hydrochloride to its freebase. Allowing for variations in purity of street cocaine hydrochloride and extraction procedures, the resulting purity of cocaine freebase samples used by some of these subjects was determined to be 95% (Siegel 1982).

Methods and Dosages

Subjects reported administering the cocaine via a straw, commercial "tooter," or cocaine spoon. Any given dose would be administered in two equal portions, one for each nostril.

Users reported administering amounts of cocaine freebase which appeared (visually) to approximate amounts of cocaine hydorchloride that they had previously used (Siegel 1977). However, because of the increased density, moisture content, and purity of the freebase resulting from the sodium bicarbonate/water extraction procedure, the actual dosages were considerably greater. It was estimated that users here were administering cocaine freebase approximately four times per day for total daily doses of 400 mg (range 200 to 1,000 mg). An important caveat is that initial doses of cocaine freebase were quite high while users experimented with its effects. As users became accustomed to the slow onset and long duration, they reported titrating dosages to those described here.

Patterns of Use and Effects

All subjects here reported intensified (daily) patterns of use whereby self-prescribed levels of stimulation and mood elevation were achieved. Unlike intensified users of i.n. cocaine hydrochloride who repeatedly dose themselves throughout the day in response to tolerance and withdrawal effects (Siegel 1977), subjects here reported infrequent dosing unaccompanied by tolerance and withdrawal. Most subjects attributed the lack of these effects to the sustained action of i.n. cocaine freebase. Surprisingly, dosing became routinely patterned and subjects reported using cocaine at approximately the same times each day. Motivations cited for use included (in descending order of frequency): to alleviate fatigue and depression; to increase performance at work; to suppress conditions of chronic pain and discomfort; and to suppress appetite.

Physically, effects reported by subjects included increased heart rate, rhinitis and other nasal problems, acute insomnia, loss of appetite, suppression of pain and discomfort, tremors, throat numbness and thirst, blurred vision, skin problems, and increased bowel movements. Psychological symptoms reported by subjects included stimulation and increased performance, mood elevation, anxiety, attention and concentration problems, irritability, and hypervigilance. Examinations and tests confirmed these reported effects. Other symptoms observed included loquacity, mydriasis, dysarthria, ataxia, and less than desirable weight.

The most striking aspect of i.n. cocaine freebase use is that such use was maintained despite little if any euphoria, and users were deceived into believing this method minimized negative effects. Unlike users who smoke cocaine freebase, i.n. subjects here did not experience a rapid reinforcing euphoria because of the slower absorption in the nasal mucosa. Nonetheless, negative reactions were still reported. Contrary to user beliefs, i.n. cocaine freebase did not alleviate the nasal problems associated with sniffing cocaine hydrochloride. In addition, i.n. cocaine freebase was associated with reports of psychosocial dysfunction including interpersonal, financial, and legal problems. Furthermore, the continued use of i.n. cocaine freebase, albeit patterned by doses which did not increase in frequency or amount, suggests that there are risks of dependency and toxicity.

COCA PASTE SMOKING

Coca paste is a crude extract of the coca leaf which contains 40% to 91% cocaine sulfate along with companion coca alkaloids and varying quantities of benzoic acid, methanol, and kerosene. In South America, coca paste, also known as cocaine base and, therefore, often confused with cocaine freebase in North America, is relatively inexpensive and is widely used by low-income populations. The coca paste is smoked in tobacco or cannabis cigarettes and use has become epidemic in several Latin American countries (Jeri 1984). Chronic coca paste smoking results in a clinical

syndrome that is identical to the mental disorders associated with cocaine freebase smoking (Siegel 1982, 1984b).

Traditionally, coca paste has been relatively abundant in South American countries such as Colombia where it is processed into cocaine hydrochloride ("street cocaine") for distribution to the rest of the world. Since 1980, there has been an increase in the number of illicit laboratories in the United States that process coca paste (Drug Reinforcement Report 1984). This has generated domestic supplies of coca paste, some of which are not refined but smoked by individuals associated with the clandestine laboratories and traf- ficking.

The Sample

A total of 45 coca paste smokers in three States were identified through contact with drug treatment centers, the criminal justice system, and private attorneys in 1984 and 1985. Eleven users (10 male and 1 female) in south Florida and six users (all male) in Arizona were given interviews and drug-history questionnaires. Twenty-eight additional users (25 male and 3 female) in southern California were given an extended series of face-to-face interviews including a mental status examination. The subjects ranged in age from 22 to 43. Twenty-seven were citizens of the United States (22 white, 3 Hispanic, 2 Asian). Four were documented aliens from Venezuela (2), Colombia (1), and Peru (1). The remaining 14 were undocumented aliens from Colombia (11), Argentina (1), Cuba (1), and Peru (1).

Use and Effects

Eight users reported initial use of coca paste in South America while the others were introduced to it in the United States. Users smoked tobacco cigarettes mixed with an estimated 250 mg of coca paste or cannabis cigarettes mixed with an estimated 100 mg of coca paste. Most users described experimental or social patterns of coca paste smoking alternating with circumstantial-situational or intensified use of i.n. cocaine hydrochloride. The remaining users described past or current histories of smoking cocaine freebase but engaged in binge use of coca paste when cocaine freebase or its associated paraphernalia were unavailable.

While coca paste smoking is rare, it is used as an alternative to smoking cocaine freebase. Coca paste smokers report that the physical and psychological effects are similar to those achieved via smoking of cocaine freebase (Siegel 1982). In addition, most users also reported respiratory problems as well as unpleasant tobacco or cannabis effects. Fourteen users were diagnosed as having a "cocaine smoking disorder" (Siegel 1984b).

DISCUSSION

The history of coca and cocaine has been a history of increasing doses, increasingly effective routes of administration, and

increasing incidence of dependency and toxicity. It is clear that cocaine has a high potential for abuse and the effects are neither predictable nor controllable, despite the claims of advertisements and aficionados.

The first commercial book on coca, by Chevrier in 1868, introduced the Old World to a New World medicine. Not surprisingly, the book contained a leaf of advertisements for a variety of coca products. These and subsequent products delivered relatively low doses via relatively slow-acting routes of administration. Few nonmedical uses and abuses were noted during the subsequent era of coca patent medicines. As cocaine replaced coca, products became as much as 200 times more concentrated, intranasal and injection routes delivered the drug faster and more effectively, and both medical and nonmedical abuses grew.

One hundred years later, James Servais, an underground film maker, released a short film entitled Coke (1968) which was little more than a commercial for nonmedical use of cocaine (Starks 1982). As if in response to this advertisement, the contemporary patterns of cocaine use began to evolve throughout the 1970s and 1980s.

The 1970s began with social-recreational patterns of intranasal cocaine use. This pattern involved use of 1 to 4 grams per person per month, consumed in several episodes. The decade ended with these same users consuming 1 to 3 grams per week in far fewer episodes. In addition, many users escalated doses and dose regimes as they changed to patterns of circumstantial-situational, intensified, and compulsive use. The pattern of cocaine smoking also appeared at this time.

The 1980s began with increased availability of cheaper cocaine and a changing pattern of binge use wherein users continued cocaine use until their supplies or bodies were exhausted. Doses still averaged 1 to 3 grams per week, but they were consumed in only one or two binge episodes per week. The 1970s observations of users titrating self-administration of cocaine, thereby circumventing negative and adverse reactions, appeared less common in the 1980s. Starting in 1982, several new patterns were emerging, including increased use of cocaine smoking and topical routes of administration. These doses and routes associated with these patterns make controlled use difficult if not impossible and substantially increase the risks of dependency and toxicity. The new phenomenon of intranasal cocaine freebase appears to recapture the slow onset and long duration of action previously associated with coca products. But the relative paucity of extreme reactions with i.n. cocaine freebase does not imply that this method has the relative safety seen with coca use. Rather, the intensified patterns of i.n. cocaine freebase use are characterized by nasal complaints and psychosocial dysfunction.

Contemporary Peruvian Indian coca users interviewed by the author believe that chewing and smoking coca is enjoyable, healthy, and safe. The coca they use contains an average 0.6% cocaine, an

alkaloid whose function is to warn insects and herbivores through bitter and intoxicating experiences to stay away. The Peruvian Indians may have learned the lessons as they refrain from using cocaine itself, which they consider unhealthy and dangerous. Similarly, contemporary tobacco users chew and smoke tobacco but most would agree that using the purified nicotine alkaloid is unhealthy and dangerous; tobacco contains a similar percentage of its nicotine alkaloid which performs the same chemical defensive function as cocaine. By liberating cocaine from the protective envelope of its leaf, contemporary users have concentrated its effects, its promises, and its problems. Intranasal and other routes of administration bypass the bitter tastes, minimize the nausea and emesis, and maximize the intoxication. Thus, contemporary users not only circumvented nature's lessons to avoid the alkaloids, they made them stronger and faster with these changing doses and routes.

From Mama Coca, who gave coca as a divine gift to Inca man, to the Inca prophecy that cocaine would destroy the white man, the history of the cocaine problem can be seen as a result of changing doses and routes of administration. From coca wines to cocaine wars (Axthelm 1984); from Metcalf's coca wine prescriptions for baseball players to modern ball players basing and wining (Johnson 1984); from Vin Mariani's Gold Medal award from the Academie Nationale (Mariani 1892) to Dr. Gold's (this volume) nationally recognized hotline for cocaine users; from the numbing effects of cocaine eyedrops to the paralyzing fear of cocaine smugglers in modern novels (Sabbag 1976; Stivers 1985); from the burning and offering of coca leaves in Bolivian mines to ward off the Devil (Nash 1979) to contemporary Bolivian cocaine production (Orellana and Zannier 1983), Miami dealers who "burn" each other (Montalbano and Hiaasen 1983) and cocaine smokers who fight with imaginary devils (Siegel 1982); from a 19th-century pest poison that promised to annihilate its victims with a greater attraction "than has cocaine for a dope fiend"[3] to 20th-century users who feel poisoned with cocaine bugs (Siegel 1978); from an economy of 50 cents to 50 billion dollars;[4] from the favorable review of coca by physicians at European trade exhibitions (Mariani 1889) to the review of the health consequences of cocaine and coca paste smoking by the World Health Organization 100 years later;[5] the promise of coca, like Claude Rains who went both mad and invisible with cocaine (Starks 1982) in The Invisible Man (1933), has all but disappeared.

A more ominous promise, forecast by Annie Meyers' confession and novels of contemporary women trapped in their own private cocaine hells (Braverman 1979; Pendleton 1985), still remains.

SUMMARY

The history of coca and cocaine use is reviewed in terms of medical and nonmedical patterns of use. Use of coca leaves and coca extract products involved daily use of no more than 200 mg to 500 mg of cocaine. When cocaine became available after 1860,

daily doses increased to as much as 1,620 mg and the oral route of administration became supplemented by intranasal, injection, topical, and smoking administration. Contemporary patterns of use between 1970 and 1978 involved social-recreational intranasal doses of 1 to 4 grams per month. From 1978 to 1982, doses increased to 1 to 3 grams per week with increased use of smoking cocaine freebase. Between 1982 and 1984, episodes of concentrated binging became more common, as did the development of experimental practices including intranasal cocaine freebase and the smoking of coca paste. These patterns are discussed in terms of several variables, including purity, dosages, dose regimes, routes of administration, paraphernalia, and changing perceptions of cocaine.

FOOTNOTES

[1]Unpublished raw data and archival information obtained from B. Hester, Khoka Productions, Inc., Jacksonville, Florida.

[2]Several earlier works, beginning with a 1787 dissertation (Julian, P.A. Disertacion Sobre Hayo o Coca dans la Perla de la America. Lima, 1787, are cited by Chevrier (1868) and referenced in the bibliography by Mortimer (1901).

[3]The product was "Rat-Annihilator" manufactured by G.P. McDermott, Indianapolis.

[4]Estimate calculated from the National Narcotics Intelligence Consumers Committee, Time (April 11, 1983), and Newsweek (August 22, 1983). Other sources estimate the street value of cocaine imports into the United States in 1984 at $17 billion (R.C. Shreckengost, personal communication).

[5]World Health Organization Advisory Group Meeting on Adverse Health Consequences of Cocaine and Coca Paste Smoking, Bogota, Colombia, September 10-14, 1984.

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Cocaine Use in America: Summary of Discussions and Recommendations

Nicholas J. Kozel and Edgar H. Adams

The expressed purpose of the technical review sponsored by the National Institute on Drug Abuse on July 11-13, 1984, was to increase the understanding of the epidemiology and clinical aspects of cocaine abuse. Scientists who participated in the meeting provided a current foundation of knowledge regarding a type of drug-abusing behavior which, in a few short years, has reached epidemic proportions and which threatens to become the most destructive drug in recent history. The state-of-the-art knowledge reflected in the chapters contained in this manuscript attests to the fact that much is known about cocaine abuse. During the course of the 3-day technical review, findings were presented that were based on sophisticated analysis and clinical observation regarding etiology, pharmacology, risk factors, patterns of use, treatment, and adverse health consequences associated with cocaine abuse. Perhaps just as important as these documented findings were the suggestions and conclusions which emanated during discussions following each presentation. While the research presentations reflected how much we know about cocaine, the discussions revealed how much more we need to learn.

Many of the issues that emerged during discussion involved basic questions, such as whether cocaine is, indeed, addictive. This question was raised in reference to the occurrence of a withdrawal syndrome following cessation of cocaine use. It was agreed that there is a difference between cocaine and the opiates and that, while one talks about "withdrawal" from opiates, the term "rebound" is more appropriate for certain other kinds of drugs.

However, there was concern that this difference in terminology perhaps was overshadowing the real issue. The scientists were willing to accept the concept of stimulant withdrawal and, indeed, concluded that chronicity of use, as opposed to binge episodic use, is a critical determinant of the onset of agitation and depression following cessation of cocaine use. Based on clinical observation, these withdrawal symptoms were most prominent in daily freebasers, followed by intravenous users, then intranasal cocaine users. In addition to route of administration, the severity of withdrawal is believed to be dose dependent. There was also general agreement that there probably is no protracted

withdrawal from cocaine; that even with the heaviest freebasers withdrawal is completed within 5 to 10 days. It also was generally concluded that patterns of use are changing, a tendency toward a significant subpopulation who ingest large quantities of cocaine--up to 5 to 10 grams daily among some intranasal users and up to an ounce daily among freebase users. These are the people most at risk for experiencing withdrawal syndrome. At the same time, low-dose users do not appear to exhibit this effect. However, conclusions are clouded by the absence of baseline "predrug" data, and it was recommended that experimental conditions be established to study the problem of cocaine withdrawal. These studies should include animal models as well as human testing, and a specific recommendation was made that rapid eye movement (REM) suppression and REM rebound effect be experimentally studied following cessation of cocaine use. Since the technical review was held, cocaine has been characterized as powerfully addictive since it was acknowledged that compulsive drug-seeking behavior may be a more important criteria for addiction than the physical withdrawal assumed by the opiate model.

In addition to the basic issue of withdrawal as a major criterion for establishing physical dependency, tolerance to cocaine also was discussed. There have been clinical reports that people have overdosed after a period of several weeks of abstinence, suggesting the loss of tolerance. At the same time, clinicians reported seeing patients who had acute psychotic episodes with cocaine and, after a period of abstinence, reinstituted cocaine use at previous levels without experiencing overdose effects. These apparently conflicting observations led to the recommendation that the scientific community study the issue of tolerance versus sensitization to cocaine's effects and, in particular, study the impact of kindling which is a phenomenon characterized by increased neural responsivity. Kindling as a learned behavior should be studied, especially as it relates to the onset of paranoid states. It was suggested during discussion that some cocaine users appear to engage in a conditioned response following ingestion of cocaine and use the drug as an inhibition releaser, granting them a license to engage, for example, in masochistic fantasies or other types of usually self-proscribed behavior.

Another basic issue which emerged during discussion involved the possibility that certain psychiatric disorders might be exacerbated by cocaine use. While limited clinical data exists, it was speculated that certain types of individuals, for example, schizophrenics and hypomanics, might be at special risk for cocaine use. In the latter case, a limited number of hypomanics who were in treatment for cocaine use reported that they titrated cocaine to maintain the hypomanic state when they started to become depressed. However, it was thought that excessive cocaine use could precipitate a full-blown mania in these people.

One of the most puzzling aspects of cocaine use brought out during the discussions was continued use despite the absence of euphoria, even to the point that the effect of cocaine became primarily

dysphoric. A question was raised whether there was fear of withdrawal among cocaine users similar to that reported by opiate addicts. It was pointed out that some patients reportedly recognized that cocaine had impaired their functioning, but their overriding fear was that cessation of cocaine use would result in further detriment. A suggestion was made that this subgroup of cocaine users who originally used the drug to facilitate performance is at great risk for continued use even though performance becomes impaired. In addition, use of cocaine may be implicated in expanded loss of judgment. This should become an area of research, as should the question of where cocaine fits in the continuum of substances of abuse, that is, whether the majority of cocaine users eventually will become compulsive and dysfunctional. While we have access to clinical populations as a result of the problems developed from cocaine use, additional information based on large-scale epidemiologic studies is needed.

Cocaine once again was singled out as the most reinforcing drug for conditioning animals in laboratory experimentation. The subtle, seductive properties of the drug which make it so highly reinforcing underlie the very problems that it causes in the human population. The development of problems directly attributable to the use of cocaine may not be apparent to the users and, in fact, may be denied. Cocaine use was reported to be present in almost all social and professional levels of society, including the health professions. At the same time, little in-depth knowledge exists about cocaine users outside of the treatment population, a group that may be entirely unrepresentative of all cocaine users.

It was pointed out by clinicians that cocaine users tend to do well in treatment. However, this observation is qualified by the fact that treatment success rates are based on a select population composed largely of middle- and upper-class professionals who enter private treatment programs. The fact that they can afford private treatment expense is itself an economic screen, and possibly an achievement screen, which may bias outcome results. Success rates raise further questions in the absence of long-term followup data, especially in light of the chronic relapsing disorder which is associated with cocaine use. Despite the selectivity of patients in treatment, certain conclusions can be drawn describing the current population. They tend to be compliant and, at least while in treatment, they tend not to have high relapse rates. However, comparison must be made with more traditional treatment populations to determine if certain factors, such as motivation, may be impacting more forcefully on cocaine treatment success. Carefully designed long-term followup studies with control groups are needed since data from some studies, such as Anker and Crowley (1982) and Siegel (1982), provide reason to question the optimistic clinical impression that cocaine abusers have high treatment completion and abstinence rates. At the same time, the point was made that we currently have many treatment strategies which can be employed in the treatment of cocaine use. Cognitive behavioral and cognitive restructuring approaches, when coupled with urine screening, have demonstrated efficacy, at least in the

short term. It was asserted that the lack of controlled studies cannot be allowed to interfere with the attempt to effectively treat people at present.

Perhaps one of the clearest messages to emerge from the technical review discussions involved seemingly conflicting reports resulting from epidemiologic analysis and clinical observation. At the treatment level, an epidemic of cocaine use was being noted. From the clinical point of view, a significant increase of patients reporting problems associated with cocaine use was occurring. At the same time, surveys indicated a plateauing of cocaine use in the general household population during recent years. This apparent contradiction was resolved during the course of the technical review. Dramatic increases in cocaine use had occurred during the mid to late 1970s, at which time large numbers of people initiated cocaine use. Many of these people eventually developed pathologic patterns of use which necessitated treatment several years later. During the last few years, treatment programs have been deluged with the casualties of that epidemic period. Thus, we do not currently appear to have epidemic levels of use so much as epidemic levels of destructive use.

As pointed out earlier and confirmed by the chapters that appear in this as well as earlier manuscripts, much is known about the epidemiology, pharmacology, effects, and treatment of cocaine. Still, much more knowledge is needed. Scientists who attended the technical review were asked throughout the meeting to identify areas of specific research concern and need. In addition to the those cited above, a number of other issues were identified, including:

- More detailed information is needed regarding patterns of use, such as dosages, frequencies, routes of administration, drugs used in combination and runs, and how different patterns of use change over time. In addition, research is needed regarding risk factors associated with cocaine use in the general population and adverse health consequences related to pattern of use.

- Pharmacokinetics and basic behavioral pharmacology data are needed and these might be obtained through animal models which look at the toxic effects associated with intravenous, intranasal, smoking, and oral ingestion of cocaine as well as dose effect.

- A survey of ear, nose, and throat specialists should be conducted to determine incidence of perforated septums and other sequellae associated with insufflation of cocaine.

- Closer collaboration between epidemiologists and clinicians should be encouraged, specifically in developing a standardized questionnaire that could be used during clinical intake and which also could be used in general

and special population surveys. This standardized set of questions could be used to obtain data on patterns of cocaine use as well as demographic data and subjective drug effect information regarding cocaine use.

- Medical examiners should be encouraged to do bronchial swabs with suspected cocaine-related cases to determine if cocaine smoking has been the route of administration prior to death. At this point, there appears to be no other technique being used to associate cocaine smoking with death other than the presence of freebase paraphernalia near the body.

- A technical review should be held regarding the legal consequences of cocaine use and the impact of the law on use patterns.

- Sociological studies should be initiated regarding patterns of cocaine use among traffickers.

- Studies of medical consequences are needed both in terms of acute and chronic consequences, as well as treatment outcome studies which control for patterns of use variables, such as route of administration.

- In-depth analysis should be conducted regarding the effectiveness and reliability of various urine toxicology techniques. Research is needed on the effect of neurotransmitter precursors in terms of short-term treatment or withdrawal from cocaine. Also, the effect of antidepressants on long-term treatment regimens should be explored.

- Research is vitally needed in the area of cocaine use among women, including the effect of cocaine on conception, on fetal development, and on neo-natal and further development of the child. In this regard, a survey of obstetricians should be conducted regarding the number of pregnant women being seen who report cocaine use in their medical history.

- Research concerning the relationship of cocaine use of parents to subsequent use by children and the efficacy of family treatment therapies also should be investigated.

- More research data are needed on risk factors associated with the progression to intensive cocaine use. Ideally this would take the form of a long-term prospective study.

- Interaction effects of cocaine with the benzodiazepines and othe depressants, alcohol and narcotics should be studied including the effect of these interactions on simple and complex performance.

- The efficacy of chemical interventions such as L trytophan, L dopa, and desimpramine on cocaine detoxification and relapse rates should be investigated.

- Using a panel design, the impact of school based drug prevention programs on subsequent cocaine use should be studied, especially broad-based comprehensive health promotion programs.

- The interaction of cocaine with common cutting agents used on the street, such as procaine and lidocaine should be investigated.

Cocaine is without doubt a powerfully reinforcing substance with clearly identifiable negative health consequences. These findings have been documented in this manuscript as well as in earlier research papers. What has become particularly clear from this technical review is that we must continue to build upon the basic knowledge already established. Research is needed in a variety of fields of science, ranging from animal models to neurochemical experimentation, from clinical studies to large-scale epidemiologic investigations. These research findings are vital if we are to avert future epidemics of cocaine use.

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